# AMERICAN RED CROSS ABRIDGED TEXT-BOOK ON FIRST AID




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LYNCH and SHIELDS

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ON

# FIRST AID

INDUSTRIAL EDITION

A MANUAL OF INSTRUCTION

BY

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# PREFACE.

The knowledge of certain facts is necessary to all students of first aid. These facts are set down in each of the editions of this book. Certain other facts only apply to special classes, however. Each edition of this manual differs, therefore, in reference to the latter. In other words the attempt has been made in each case to give only the facts which will be of value to the class for which the edition is intended. This is the *Industrial Edition* and it is intended for the worker in the industrial field.

The present edition will appear in Polish, Lithuanian, Italian, and Slovak, as well as in English, so that it may be read by the majority of miners. It is believed that the form in which it appears will prove acceptable, but in order that it might reach the largest possible number of persons the cost of publication has been kept down by every permissible economy.

As the experience of the authors has increased in first-aid instruction and one of them now devotes his whole time to this work among miners in the interests of the American Red Cross and the other is in charge of the first-aid department of that organization with its numerous ramifications throughout the United States, they have become more and more convinced of the benefits to be gained from such instruction. Nor has it ever proved difficult in their experience to teach first aid. All that is necessary is a serious wish to learn and a practical course of instruction. The first must be supplied by the student. It is hoped the second is provided by this book as far as may be. It is not enough to read the book, how-

ever, the pupil must himself actually practice first aid on a comrade who is supposed to be injured, and whenever possible it is very important that this be done under the direction of a competent teacher.

In a previous first-aid manual by one of the authors the importance of learning the prevention of accidents was emphasized, and this is also done in the present book. Prevention is better than cure in injuries as well as in disease. It is hoped that if nothing further is learned from this book the reader will at least be led to use common care if not for his own sake for that of those who are dear to him.

Both the authors of this small book have published previous text-books on the subject of first aid to the injured and these have been freely quoted here as seemed most advantageous. In fact, much of the material found here may also be found in the American National Red Cross Text-book on First Aid and Relief Columns.

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# INTRODUCTION.

Statistics in reference to industrial accidents in the United States are not complete nor accurate, but it is generally believed that some 500,000 persons yearly are killed or incapacitated. This, entirely aside from personal loss and that to family and friends, estimating the average earning power at but $500, means an actual loss to the community of $250,000,000 per year. That the danger of accidents is generally recognized as very great is shown by the fact that in 1908, $22,392,072 was paid in premiums to insurance companies for liability insurance. The death-roll of the railroads alone for the last twenty years, extending from 1888 to 1907, reached 153,366. The total killed in that period exceeds the aggregate of the killed in the Federal Army in the Civil War. Placing these figures in table form, we have this contrast:

| | |
|---|---|
| **From 1888 to 1907—Railroads:** | |
| Killed | 153,366 |
| Injured | 1,042,486 |
| **From 1861 to 1865—in Federal Army:** | |
| Killed | 110,070 |
| Wounded | 275,175 |

From German statistics on this subject, which are very carefully collected, it appears that the greater number of industrial accidents, 57.95 per cent., are due to negligence of employees or employers, and 42.05 per cent., the smaller number, to the inevitable risks of employment.

It is estimated that in this country 66 per cent. of accidents are due to negligence on the part of employees or employers, and 34 per cent. to the inevitable risks of employment.

It is not necessary to prove, therefore, that attention given to learning how to prevent accidents will pay. Nor is it any more difficult to prove that knowledge of first aid will pay. In certain mines in Pennsylvania first aid to the injured has been well and generally taught to miners. This instruction and this alone has resulted in reducing sick and death benefits 50 per cent., or one-half. That is to say it has been proved that if employees know first aid their chances of recovery from injury are doubled.

It seems clear enough from what has been said that there are thousands of men in our industries who are liable to injury and that a large percentage may escape injury by the exercise of more care, and that if an injury is received knowledge of first aid is going to diminish deaths and disabilities.

Remember always that the treatment given in the first few moments may decide whether the patient is to live or die; but, on the other hand, do not attempt to give treatment which should only be given by a skilled physician and do not fail to call a doctor when necessary. Remember also that learning first aid consists in learning what not to do as well as learning what to do.

# AMERICAN RED CROSS ABRIDGED TEXT-BOOK ON FIRST AID.

## INDUSTRIAL EDITION.

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### CHAPTER I.

### STRUCTURE AND MECHANICS OF THE BODY.

A workman, in order that he may repair his machine, must know exactly how it is made and how it operates. This is exactly the knowledge which a surgeon should have of the human body. The latter is such an extremely complicated mechanism, however, that months and years are needed to acquire such knowledge. Fortunately, it is not necessary for the first-aid student to go far into these subjects. His efforts to relieve suffering should be confined to emergency treatment. To render this intelligently it is necessary to know comparatively little of the structure and mechanics of the human body or, in technical terms, of anatomy and physiology.

In this chapter will be found all facts on these two subjects which are necessary for the student of first aid. But even the comparatively simple anatomy which he must know cannot be learned from books alone. What is said here should, therefore, be added to by careful study of the skeleton and of the form of its more important bones and of his own body or, better, that of a comrade. Thus the positions and relations of the more important

structures may be clearly pictured in his mind. Good charts such as those of the Red Cross may be made of considerable assistance to him in this connection.

## THE BODY.

The body is composed of hard and soft parts. The bones are the hard parts and the muscles and the internal organs, such as the heart, lungs, liver, etc., constitute the soft parts.

### BONES.

The bones are hard and firm and together make up the Skeleton.

**The skeleton—**

Forms a strong and rigid frame-work for the body.

Supports and carries the soft parts.

Protects vital organs from injury.

Gives attachment to muscles.

Forms joints so that movements are possible.

The skeleton is divided into three parts:

1. **The Head,** made up of the Cranium, a bony case which encloses and protects the brain; and the Face, with the eyes, ears, nose and mouth. The only movable bone in the head is the lower jaw.

2. **The Trunk,** which is divided into two parts by a muscular partition—the diaphram. The upper portion is the Chest, which contains the esophagus or gullet, the lungs, the heart and some large blood-vessels. The lower portion is the Abdomen, in which are found the stomach, liver, kidneys, bladder, the intestines and other organs.

The trunk is formed of several bones which are of interest to the first-aid student.

*The Spinal Column*, a strong pillar with several curves, is made

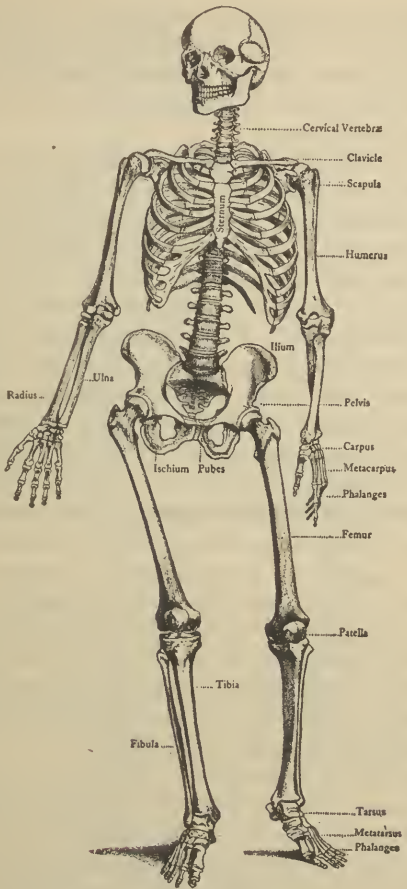


FIG. 1.—The skeleton. (*Holden.*)

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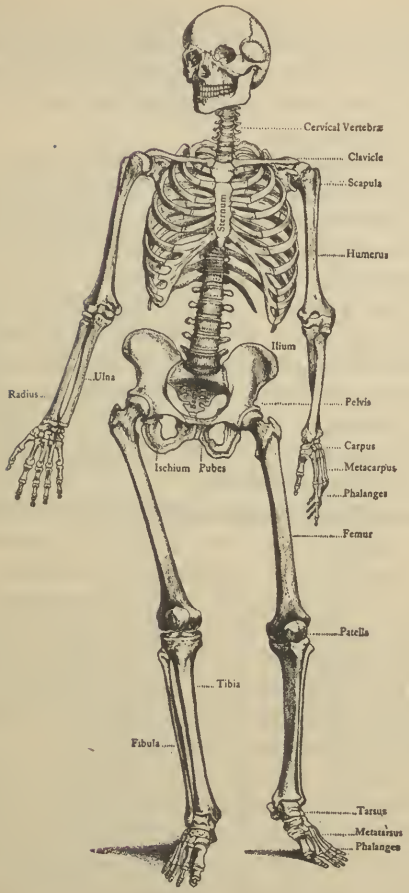



FIG. 1.—The skeleton. (*Holden.*)

up of a number of bones called vertebræ with a softer substance called cartilage between them. At its lower end, the spinal column terminates in the broad Sacrum or Rump Bone and the pointed Coccyx. The spinal column supports the head and the ribs, and is itself supported on the pelvis.

*The Ribs*, 12 in number, form the greater part of the walls of the chest. All the ribs are connected to the spinal column behind, but the two lower ones on each side are shorter than the others and are not connected to anything in front. The 10 upper ones on each side are united to the Breast-bone.

*The Breast-bone or Sternum* is a flat, dagger-shaped bone which forms the front of the chest. Above it forms joints with the Collar-bones, or Clavicles, being notched for the purpose on each side.

*The Pelvis* is a wide, strong, bony basin formed of the Haunch bones (ilia) at the front and sides and partly behind where it is closed by the sacrum and coccyx. It supports the trunk and forms joints with the lower limbs.

3. **The Extremities Comprising the 2 Upper and the 2 Lower Limbs.** Each upper limb is made up of the Scapula or Shoulder-blade, a flat, triangular bone at the back of the shoulder; the Clavicle or Collar-bone, a curved long bone placed horizontally across the upper part of the chest above the first rib; the Humerus, the bone of the upper arm; the Radius and the Ulna, the two bones of the forearm; and the Hand, which has 8 small, irregular bones in the Carpus or wrist, five Metacarpal Bones for the hand itself, and 14 bones, Phalanges, in the fingers and thumb.

Each lower limb is made up of the Femur or Thigh-bone; the Patella or Knee-cap; the Tibia and Fibula, the two leg bones; and the Foot. The foot is made up of the Tarsus, with seven irregular bones, which form the heel, part of the ankle, and the instep, 5 Metatarsal Bones for the middle of the foot; and the toes with 14 bones, Phalanges.

The principle interest which bones have for the student of first aid is that they may be broken or fractured, one of the commonest accidents. (See Fractures, page 63.)

## JOINTS.

Wherever two or more bones are in contact or touch each other they form a joint. The ends of bones forming a joint are covered with a smooth substance called cartilage or gristle, so that they may move without friction on each other. Joints are hermetically closed by a flexible sac, the capsule, which secretes an oily fluid. This fluid lubricates a joint just as oil does an engine. The ligaments of a joint are strong, fibrous bands which hold the bones together. The most important joints to study are the hip and shoulder, which are ball-and-socket joints having movements in all directions, and the elbow, wrist, knee and ankle, hinge joints. These have only to and fro movement like an ordinary hinge.

Joints are of importance to the student, as bones are liable to be put out of place or dislocated at the joints. (See Dislocations, page 59.)

## MUSCLES.

The movements of bones at the joints are caused by the Muscles.

The muscles, the flesh or meat, form two-fifths of the body by weight. They are made up of red fibres which have the power of shortening or contracting, so that if one end of a muscle is fixed and the muscle is contracted the other end will pull on and move whatever it is attached to. By doing this muscles cause all the movements of the body. For example, the biceps, the big muscle at the front of the upper arm, by contracting causes the elbow joint to bend by bringing the forearm closer to the upper arm. All muscles are somewhat on the stretch, as otherwise prompt movement would be impossible. Some of the muscles are attached to


FIG. 2.—The muscles. (*Brubaker.*)

bones by Tendons or sinews. These are strong, fibrous cords. They may be well seen in the wrist.

Muscles are of two classes: Voluntary muscles, such as those of the arm and leg—these are under the control of the will; and Involuntary muscles, such as the heart—these work independently of the will. By this wise provision of Nature all vital processes go on without our being compelled to give any thought to them.

Voluntary muscles are of prime interest both in fractures and in dislocations, as their pulling causes displacements and their resistance offers the chief obstacle to setting fractures and to reducing dislocations. (See Fractures and Dislocations, pages 63 and 59.)

## CIRCULATION.

**The Heart.**—In order that the blood may reach all parts of the body it is, of course, necessary that some force shall propel it. This is provided by the Heart, which is not the seat of the feelings, but a most skillfully devised pumping machine.

The heart is about the size of a man's fist and is located in the chest between the lungs. It is a hollow, muscular organ, with valves which close and prevent the blood from flowing backward, all its force being expended to send the blood forward. The beat of the heart which we feel in the chest is its contraction by which it is made smaller inside, thus forcing the blood to the furthest parts of the body. After the heart contracts it dilates or becomes larger inside and the valves open so that it may fill with blood. The next contraction again forces the blood forward, and so on as long as a person is alive.

The heart contracts usually about 72 times per minute.

While, as has just been stated, the heart is a pump, it is not a single but a double pump, being divided into two entirely separate halves by a muscular partition. The left side of the heart, or the

left pump, drives the blood through the body, and the right side drives it through the lungs alone.

**Blood-vessels.**—A series of closed tubes, or blood-vessels, as they are called, carry the circulating blood. They are of three classes: 1, Arteries; 2, Capillaries, and 3, Veins.

1. **Arteries.**—Leaving the left side of the heart is the largest artery in the body—the Aorta. This strong tube is just about large enough so that a man's thumb may be introduced into it if it is separated from the heart. It soon divides into branches which again branch and rebranch, the individual branches constantly growing smaller in size, to reach finally the furthest parts of the body. It should be remembered, too, that the smaller branches of the arteries join freely with one another. The blood passes from the heart to the aorta and thence to the smaller arteries, not in a steady stream but in waves, each of which is produced by a contraction of the heart. The beat of these waves causes the Pulse, which may be felt not only at the wrist and temple, but also anywhere else an artery is near enough the surface of the body. Naturally, if an artery is cut, there will not be a steady stream flowing from it, but the blood will be expelled in spurts or jets. The walls of arteries, especially those of large calibre, remain apart when divided.

As the course of the blood in the arteries is away from the heart toward the extremities and the head, if an artery is cut, in order to stop the bleeding the artery must be compressed either on the side of the heart or on the bleeding point itself. Pressure on the further side of the cut will, as may be easily understood, do no good so far as stopping bleeding from an artery is concerned. It is also necessary to press on the artery on the near or heart side as close to the bleeding point as possible. This is because arteries in their branching and re-branching join each other, and if pressure is made on an artery far above the bleeding point, so many branches

may bring blood into it between the point of pressure and the bleeding point that a great deal of blood will be lost, notwithstanding the fact that the main branch is blocked by pressure at a distant point. However, it is not in every part of the body that arteries lie near enough to the surface to be compressed in their course. Moreover, it is necessary in compressing an artery to select a point where a nearby bone gives a hard surface to press against. Therefore, the student of first aid must know, first, the situation and course of the principal arteries and, second, the points on which pressure will be effective.

The aorta has three great branches which are of particular interest to the student of first aid. One of these, the Carotid, supplies the head and neck with blood; the second, the Subclavian, the upper extremity; and the third, the Femoral, the lower extremity.

The table which follows gives certain necessary information regarding these arteries and their branches.

| Artery | Course | Point on which to exert pressure |
|---|---|---|
| | HEAD AND NECK. | |
| Carotid ..... | From upper, outer edge of breast-bone to angle of jaw. | Deep. Down and back, an inch to the outer side of Adam's apple. |
| Facial (a branch of carotid). | Diagonally across the lower jaw from below upward. | On the face, an inch in front of the angle of the lower jaw. |
| Temporal (a branch of carotid). | Upward one-half inch in front of ear. | On skull, immediately in front of upper part of ear or on temple. |

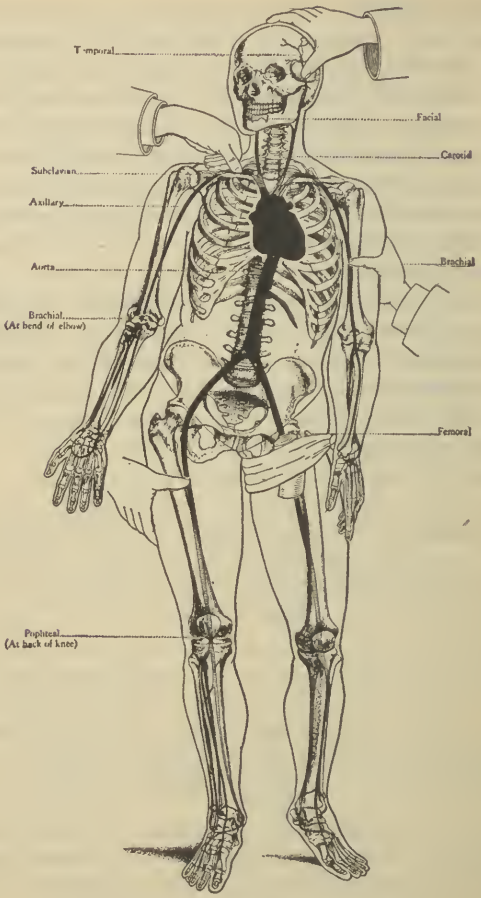



FIG. 3.—The arteries and pressure points.

### Upper Extremity.

| Artery | Course | Point on which to exert pressure |
|---|---|---|
| Subclavian..... | Across the middle of first rib to arm pit. | Deep. Down and back over centre of collar-bone on first rib. Shoulder should be drawn down first. |
| Brachial (a branch of a branch of the subclavian). | Descends along inner side of biceps muscle; about line of seam of coat, to just below centre of crease at bend of elbow. | Against humerus by grasping and pulling biceps to outer side. Or at elbow by putting a tight roll of cloth or a rolled bandage in bend of elbow, and bending up arm as much as possible. |

### Lower Extremity.

| | | |
|---|---|---|
| Femoral..... | Down thigh from pelvis to knee, line from middle of line between point of hip and centre of pelvis in front to inner side of knee. | Against femur high up inner side in line given about three inches below upper end of line. |
| Popliteal (a continuation of the femoral). | Down in middle of space at the back of knee-joint. | In bend of knee as described for elbow. |

Arterial bleeding is always more serious than other bleeding because blood thrown out in jets from the cut artery with each contraction of the heart is rapidly lost. The blood which spurts from an artery is always bright red in color, as arterial blood has not yet lost the characteristic bright red of the oxygenated blood from the lungs.

2. **Capillaries.**—The arteries, as they go further and further from the heart, become smaller and thinner-walled, till they finally terminate in still smaller vessels which are called capillaries, from the Latin word meaning a hair. The capillaries form a delicate network of vessels everywhere, and give the rosy color to the skin. Slight pressure on the skin will cause a white spot to appear. This is because the pressure has forced the blood from the net-work of capillaries and the white skin is seen instead of the rosy color due to the presence of the blood in the capillaries. In capillaries the pulse, or contraction wave from the heart, is no longer apparent, as these fine, hair-like tubes break up the waves. Slight cuts or pricks of the skin are sufficient to divide some capillaries and therefore to cause bleeding. Naturally, on account of the minute size of these vessels, bleeding from them, except from a very large surface, is not dangerous to life. Capillaries branch so freely that pressure used to check capillary bleeding, to be effective, must be made on the bleeding point.

The blood lost from capillaries is no longer bright red in color like that from arteries, but is somewhat darker.

3. **Veins.**—The blood-vessels which return the blood to the heart from the points furthest from it are called veins. They may be easily recognized as the blue lines under the skin. Capillaries unite to form small veins, these unite to form larger veins, and finally these vessels become very large before entering the right side of the heart. The best known of the large veins is probably the jugular vein of the neck. Bleeding from a cut vein is in a

continuous flow instead of in jets as is the case with bleeding from arteries, and it is mainly through this difference that one distinguishes venous from arterial hemorrhage. Venous blood, too, is dark, bluish-red in color, as the oxygen in the blood stream is lost in its passage through the capillaries. While bleeding from veins has not the almost terrifying appearance of arterial bleeding, a dangerous amount of blood may be lost from a large vein. As the course of the blood in the veins is toward the heart, in stopping bleeding from them pressure must never be made on the side toward the heart, but on the bleeding point or on the side away from the heart.

**The Blood.**—The blood is a fluid which carries properly prepared food, oxygen, and heat to feed and warm all parts of the body, from which it also removes waste materials for final expulsion. These processes go on constantly as long as life lasts. Coagulation or clotting is the property of the blood which is of most interest to the student of first aid. While the blood is circulating in the living vessels it remains fluid, but as soon as this influence is removed it coagulates or clots, thus tending to stop bleeding. It is easy to see if Nature did not provide this safeguard that the slightest scratch sufficient to draw blood would result in the loss of all the blood in the body. The rate of loss would be regulated simply by the size of the opening just as is that of water flowing from a pipe. Very rarely a person is found whose blood does not clot. These people are called "bleeders," and they often bleed to death from a trivial injury, such as the pulling of a tooth.

In order that one may know what to do to stop bleeding, it is necessary to know what conditions favor or impede coagulation of the blood. First in importance, in order that blood may clot, is comparative rest. A spouting stream of blood will never clot except where it falls and is therefore at rest. Free exposure to air also favors clotting. Coagulation is likewise more promptly

effected by contact with foreign substances, especially if they afford many points on which clots may form. Gauze is a good example of such a material. Cobwebs are also, and they were much used even by surgeons before the danger of dirt in a wound was so well understood.

For further discussion of this subject, see Hemorrhage, page 81.

## RESPIRATORY SYSTEM.

The Respiratory System consists of the Nose and Mouth, the Windpipe and the Lungs. All of these organs except the lungs may be regarded simply as the passageway for the air going to and coming from the lungs. Naturally, anything which blocks this air in its course will interfere with the supply of air to the lungs and complete blockage will result in early death from smothering or asphyxiation.

At the upper end of the windpipe is the Larynx, part of which we know as the prominent Adam's Apple in the throat. As the larynx is in front and the gullet is behind, food passing to the latter must pass over the upper end of the larynx and would enter it if some protection were not provided. This is afforded by the Epiglottis, a muscular flap or curtain which falls into position, covering the upper end of the larynx so that ordinarily food does not enter it. Sometimes, however, the epiglottis does not do this, especially if one swallows quickly or attempts to talk while swallowing. In this case choking results from food entering the larynx, or, in common words, one has swallowed the wrong way. The attempt to give food or water to an unconscious person will also result in choking him because his epiglottis does not close.

The Lungs may be described as two soft, spongy structures, each of which is bag-like in shape and is made up of air cells with

many blood-vessels surrounding them; they are sometimes compared to a bunch of grapes. The lungs are hermetically enclosed in the chest, so that when the cavity of the chest is increased or diminished in size, the same effect is produced on the lungs themselves. Certain muscles are of great importance in filling and emptying the chest and lungs. Ordinarily, the muscular movement consists simply of the bellows action of the chest and the up and down movement of the diaphragm. In order that the chest may be enlarged to its greatest capacity, however, some of the muscles of the upper extremity must also take part. In order that they may do so, the arms are raised vertically above the head, so that certain muscles attached to the chest wall and to the upper extremities will, when the latter are fixed, raise the ribs and thus enlarge the chest. The chest, too, is elastic and direct pressure upon it will diminish its size and so force the air from the lungs. (See Artificial Respiration, page 107.)

The rate of respiration is 16 per minute.

The lungs aerate or oxygenate the blood. The small blood-vessels surrounding the air cells which the pure air breathed in finally reaches, carry dark blood which has lost its oxygen in the body. This blood receives oxygen from the pure air and returns to the heart as bright arterial blood. The air which is expired from the lungs has not only lost its oxygen to the blood, but has also received certain impurities from the latter.

## DIGESTIVE SYSTEM.

This is the system by which the food is received and prepared for the use of the body. From the mouth the food enters the Esophagus or Gullet through which it passes to the stomach and then to the Small and Large Intestines from which the residue is expelled.

## NERVOUS SYSTEM.

Through the Nervous System the actions and functions of the various parts of the body are performed, regulated and controlled This system is really double. One part is composed of the Brain, Spinal Cord and Nerves connected with them, and the other is the so-called Sympathetic Nervous System.

# SPECIAL SENSES.

## THE EYE.

The Eye is the organ of sight. It is a ball surrounded by three coats. Covering the eyeball in front is a delicate membrane called the Conjunctiva. Protection to this membrane is afforded by the eyelids when they are closed, but when they are open it is very liable to injury and to the entrance of foreign bodies. These are commonly spoken of as "something in the eye." On account of the sensitiveness of the conjunctiva, they cause much pain and distress. The eyeball itself is well protected from injury, as it is situated deeply in the head and the brows overhang it. Pointed objects may, however, enter it. When this occurs severe damage almost always results.

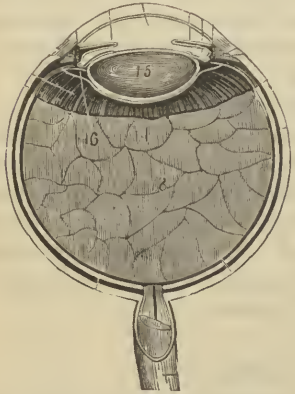



FIG. 4.—The eye. (*Potter's Anatomy.*)

## THE EAR.

The Ear is the agent of hearing. Leading from the outer ear which we see is the auditory canal which ends in the Ear Drum.

Rupture of the drum is a very serious accident as it results in deafness. It is caused by a loud concussion near the ear, or by putting objects, especially pointed ones, into the auditory canal, as well as by disease.

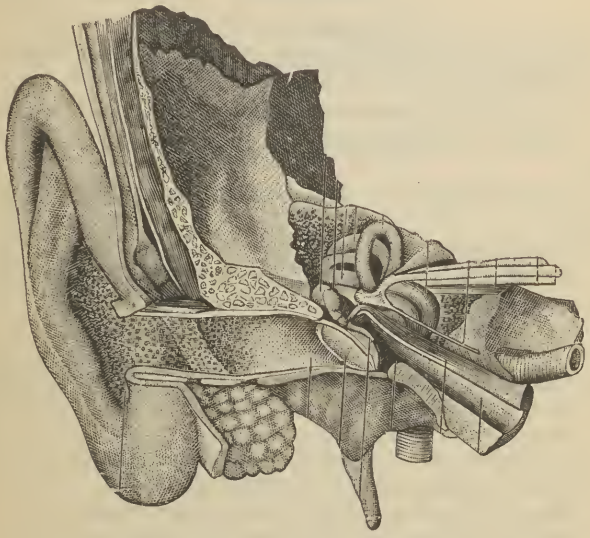


FIG. 5.—The ear. (*Gould's Dictionary.*)

## THE SKIN.

The Skin covers the entire body. Under it is a fatty layer, the padding, which assists it to prevent the escape of the body heat which is produced by chemical processes in the interior of the body.

One of the most important functions of the skin is to act as a defense against the introduction of germs into the tissues of the

body. Germs cannot pass through the unbroken skin, and any injury which is accompanied by a break in the skin makes a breach in this defense and is therefore much more serious.

## QUESTIONS.

1. Of what is the body composed?
2. What is the skeleton and what does it do as a part of the body?
3. Of what parts is the head made up?
4. Into what two parts is the trunk divided and what does each contain?
5. Describe the spinal column; the ribs; the breast-bone; and the pelvis.
6. Of what bones is the upper extremity formed? The lower extremity?
7. What is a joint?
8. What movements do joints have? Give an example of a ball-and-socket, and a hinge joint.
9. What are the muscles?
10. What is the purpose of the muscles?
11. What is the difference between voluntary and involuntary muscles?
12. What is the importance of muscles in reference to fractures and dislocations?
13. What is the purpose of the heart? Describe its action.
14. What is the heart beat and how often does it occur?
15. What are the different classes of blood-vessels; describe each.
16. What are the characteristics of bleeding from an artery?
17. In bleeding from an artery where would you press, and why?
18. Give the points of pressure for the following arteries: Carotid, Facial, Temporal, Subclavian, Brachial (2), Femoral, and Popliteal.
19. What are the characteristics of bleeding from capillaries?
20. How would you stop bleeding from capillaries, and why?
21. What are the characteristics of bleeding from veins?
22. How would you stop bleeding from veins?
23. What is the blood? What does it do?
24. Describe clotting of the blood?

25. What helps to make the blood clot?
26. Of what does the respiratory system consist?
27. Why would you not give food or water to an unconscious person?
28. Describe the action of the lungs? What is the purpose of the lungs?
29. What is the purpose of the digestive system?
30. What is the purpose of the nervous system?
31. What may cause a rupture of the ear drum?
32. Why does something in the eye cause so much pain and distress?
33. What is the purpose of the skin?

## PRACTICAL EXERCISES.

(In order to make such exercises of value a "subject" on which to illustrate will usually be necessary. A small boy should be procured for this purpose or a member of the class may be asked to volunteer.)

Show the bones and joints on a chart of the skeleton.

Show some of the muscles on the subject and explain the action of the muscles in fractures and dislocations.

Show the circulation on the chart.

Show the points on which pressure should be made on arteries on the subject.

Illustrate the action of the muscles in respiration on the subject.

Describe the eye on the subject.

## CHAPTER II.

## FIRST-AID MATERIALS.

BANDAGES; COMPRESSES; SPLINTS; TOURNIQUETS; HEAT; COLD; STIMULANTS; EMETICS.

It is almost as important for the workman responsible for the operation of a machine to know how to make practical use of the tools which he requires to repair it as to know how the machine is constructed and how it operates. This is equally true for the first-aid student. Therefore, this chapter is devoted to his tools and repair materials.

### BANDAGES.

Bandages are used for the following purposes:

To keep dressings in place.

To fix splints.

To stop bleeding by pressure.

As slings.

Whatever the bandage used, care must be taken that it is not put on too tightly. It should be firm and secure, but must not be so tight that it presses and constricts at any point, for this will interfere with the circulation by cutting off the blood supply, and if the bandage is left in place for some time even so severe an injury as mortification or actual death of the part may be caused.

Any bandage may be fastened by a knot or be pinned or sewed. If a pin is used, a safety-pin is preferred, as it holds better and one

is less likely to be scratched by it than by the pin with unprotected point.

The reef knot, as it is secure, should always be employed in place of the granny knot. To tie the reef knot proceed as follows: Hold the ends of the bandage in the two hands; wind the end held

FIG. 6.—Reef knot. (*Davis.*)

in the right hand over that held in the left; then wind the end now held in the left hand over that held in the right and bring it through the loop. When a choice is given, the knot should be placed where it causes no discomfort to the patient and where it may be easily reached.

FIG. 7.—Reef knot. (*Davis.*)

The kinds of bandages used are:
The triangular bandage.
The roller bandage.
Special bandages.

**Triangular Bandage.**—The triangular bandage is perhaps best suited for general first-aid work, as it can be easily made, is not difficult to apply as a temporary dressing and is not likely to

be put on so tightly that it will cause injury by stopping the circulation.

The triangular bandage is preferably made from unbleached cotton cloth, though any strong cloth will answer. Bed sheets, pillow cases, napkins and handkerchiefs are all used in case of emergency. It is desirable that the piece of cloth for the bandage be not less than 34 to 38 inches square. It is folded diagonally and is cut across in the fold; of course this will give two triangular bandages. While made triangular bandages may be readily bought, the only advantage they possess is that most of them have illustrations showing methods of application stamped upon them.

FIG. 8.—Triangular bandage.

The triangular bandage may be applied in two ways:

Unfolded.

Folded.

Unfolded means that the bandage is used in the form of the whole triangle.

To fold, the point of the triangle is brought to the middle of the opposite side, and then the bandage is folded into three, lengthwise.

FIG. 9.—Brachio-cervical triangle. (*Esmarch and Kowalzig.*)

It is, of course, necessary to determine in each case of injury in what special way the triangular bandage will be used and persons expert in its use are very skillful in adapting it to special cases. Certain set methods have, however, been found by experience to be the most generally useful, and these will now be described.

The most important uses of the unfolded triangular bandage are the following:

1. **Arm sling.**

Place one end of bandage over shoulder of uninjured side. Allow length of bandage to hang down in front of chest so that point of triangle will be behind elbow of injured arm. Bend elbow of injured arm to a right angle. This will bring forearm across middle of bandage. Then carry lower end of the bandage over the shoulder of the injured side and tie to the upper end behind the neck. Bring the point of the bandage at the elbow forward to the front and pin there so that bandage is snug but does not pull. (Fig. 9.)

This makes an excellent arm sling, but even without a bandage a good sling may be made for the arm by pinning the sleeve or the skirt of the coat to the front of the coat. The shirt may be used in the same way. (Fig. 10.)

Fig. 10.—Arm sling from shirt sleeve.

2. **Foot bandage.**

Spread out bandage. Place foot in centre with toes toward point. Raise point over toes to instep in front. Bring both ends forward, cross them over instep and tie them round the ankle. (Fig. 11.)

This bandage has but a limited range of usefulness.

3. **Hand Bandage.**

This is applied exactly like the foot bandage. The bandage is spread out. The hand is placed on it, palm down, with the fingers toward the point (if desired, the hand may be closed), and the wrist is at the long side. The point is then brought over the back of the hand to the back of the wrist and the two ends are crossed over the wrist and tied.

Fig. 11.—Triangular bandage for foot.

This bandage will be found useful more often than the preceding one.

4. **Head Bandage.**

First, fold a hem about one and one-half inches wide at the long side of the unfolded triangular bandage. Place the bandage so that the hem lies squarely across the forehead just above the eyes and the bandage is over the head with the point hanging down the back. Carry the two ends around the head above the ears, cross at the back and tie them across the forehead. Draw the point down tight, turn it up and pin it at the top of the head with a safety-pin. (Fig. 12.)

This is a useful bandage.

The triangular bandage, folded, is sometimes called the cravat bandage, and in practice by folding the cravat is made wider or narrower as required. As may readily be seen, a cravat may be made of use in any part of the body. It is especially useful to hold splints, dressings, etc., in place, and to check bleeding when applied snugly so as to compress the bleeding point.

The following are good examples of the use of the folded triangular bandage, or cravat.

1. **Eye Bandage.**

Place the centre of the cravat over the injured eye, bring the ends to the back of the head and tie. (Fig. 13.)

2. **Jaw Bandage.**

For this, two cravats are necessary. Apply the centre of the first across the chin in front, bring the ends to the back of the neck and tie. Place the centre of the second cravat under the chin, cross the ends over the top of the head, bring them down and tie under the chin.

3. **Neck Bandage.**

The centre of the cravat is placed over the injured place and the ends are carried around the neck and tied as convenient. This

FIG. 12.—Triangular bandage applied to head.

bandage may sometimes be improved by the use of a cardboard support which is held firmly in place between the layers of the bandage.

4. **Bandage for Palm of Hand.**

Place the centre of the cravat on the palm of the hand, cross the ends at the back of the hand and again at the front of the wrist and tie at the back of the wrist. (Fig. 14.)

The cravat may also be used for an arm sling. For this purpose it is employed in the form of a loop which encircles the forearm

bent at a right angle and the neck. When the cravat is used to hold splints or dressings in place on an extremity it is simply carried around the splint, or dressing, and the limb, and is tied at the most suitable point. Of course, the number of cravats employed for this purpose is dependent on the size of the special splint or dressing.

FIG. 13.—Eye bandage.

**The Roller Bandage.**—The roller bandage may be used for any of the purposes already described, though as sometimes employed by the surgeon it is rather too complicated for the student of first aid. Lengths cut from the roller bandage may, of course, be used to replace the folded triangular bandage, and for the unskilled this method of application is always to be preferred to that usually employed by the surgeon, which consists of winding the roller around and around the part which it is desired to cover. This method of application makes the roller bandage especially valuable in maintaining pressure so as to stop capillary bleeding, to fix dressings after operation, etc. These are not, however, questions which often confront a student of first aid, so if they were the only ones the use of the roller bandage might be wholly disregarded here.

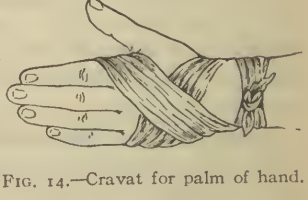


FIG. 14.—Cravat for palm of hand.

But this is not the case. The first-aid student should know how to take advantage of any appliances he may have at hand and he is very likely in an accident to find it much more convenient to

obtain the roller bandage, so for this reason he should know the principles of its application.

Roller bandages are usually made of muslin, cotton cloth, flannel, gauze or cheese cloth, and they may be improvised by tearing strips from a sheet and rolling them up. By far the best material is gauze or cheese cloth. This is elastic and adapts itself well to the part to be bandaged so that it is easy to apply and does not have the disadvantages of the old inelastic bandages of muslin, etc., which in unskilled hands are very apt either to be

FIG. 15.—The circular. (*Davis.*)

pulled so tight on one edge that they cut off the circulation or to be so loose that they will not stay in place.

While roller bandages may usually be readily bought, it is well to know how they should be rolled. One end of the bandage should be turned over for a distance of about 6 inches, this lap should be folded on itself and this process should be repeated till a small hard roll is formed. Then place the bandage on the thigh (the foot should be on a stool or chair so that the thigh is nearly at right angles to the body) with roll of bandage near the body, length of bandage at bottom of roll and bandage extending down the thigh. Roll, beginning with the fingers of right hand running down to the wrist, and repeat till bandage is completely rolled. The left hand is used to hold the bandage tight and even. The

bandage when completed should be in a hard roll with even edges. It may be fastened with a couple of pins.

Roller bandages are preferably used in the following sizes:

For the finger, $\frac{3}{4}$ of an inch wide and 1 yard long.

For the arm and head, $2\frac{1}{2}$ inches wide and 4 to 6 yards long.

For the leg and thigh, 3 inches wide and 6 to 8 yards long.

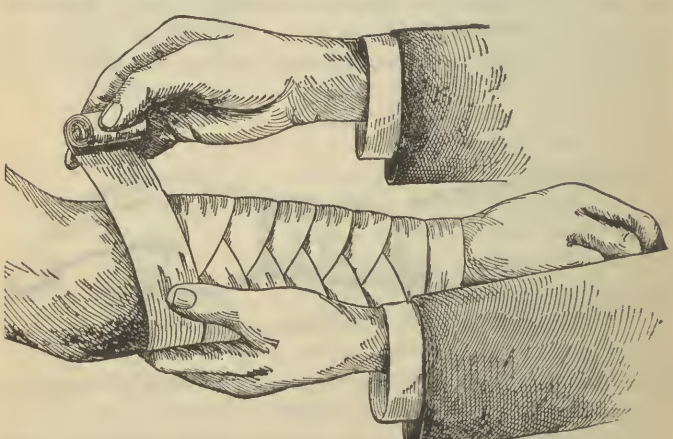


FIG. 16.—The reverse. Preparing to reverse. (*Davis.*)

For the chest and abdomen, 4 to 5 inches wide and 8 to 12 yards long.

The bandage $2\frac{1}{2}$ inches wide and 4 to 6 yards long is the most generally used.

While it is not, of course, absolutely necessary to use the bandage best adapted in size for the part to which it is to be applied, it should be remembered that it is very difficult to bandage satisfactorily a small part with a wide bandage. Any bandage when rolled may

be easily cut through with a sharp knife and thus a bandage of the required size may always be obtained.

The roller bandage is applied by holding the roll in the right hand, the loose end being in the left, and laying the outer side of the end on the place where it is desired to start the bandage.

The simplest method of application is the Circular, but this can be used only when the part to be bandaged is of nearly the same

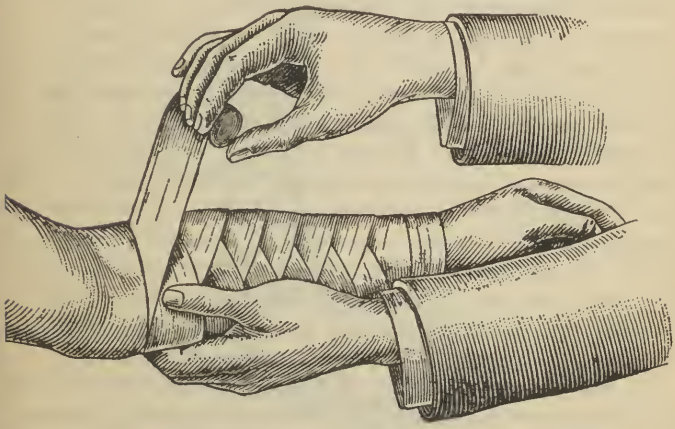


FIG. 17.—The reverse. The roller reversed. (*Davis.*)

circumference throughout. This is the case with the forearm above the wrist and with the fingers. Moreover, in first-aid work the roller bandage is usually applied to hold splints or dressings in place which much extends the field of the circular method of application as, especially with splints, an even circumference is likely to be presented. The circular method is also more often available with gauze bandages for on account of their elasticity they adapt

themselves to slight pulling much better than do bandages made of stiffer cloth. The circular method of application consists simply of a series of circular turns from below upward, each turn overlapping the upper third of the one below.

Where the part is larger at one end than the other, at the start a few turns should be made round and round one over the other, then begin to move up the limb, using the circular method as long as a turn overlaps the preceding one about one-third. It will be found as soon as the limb increases notably in size that if the bandage lies flat, spaces will be left. To prevent these spaces the Reverse must be employed. The Reverse is generally considered to be the most difficult point to learn in the application of the roller bandage. This is not quite the case, however. While it is certainly much more difficult to bandage successfully a part larger at one end than the other, this is due rather to the fact that one not experienced in bandaging is likely to try to force the bandage instead of at once resorting to the method which allows it to lie flat, and thus to make unsightly and insecure loops at the back where they are not immediately seen than to any real difficulty in making the reverse itself. Bad bandaging in this as well as in other respects can only be avoided by practice and care.

To make the Reverse, place the thumb of the left hand on the lower edge of the bandage to hold it in place, slacken the bandage between the hands (about 3 inches) and turn the roller one half over toward you. Pass the roller under the limb keeping the lower edge of the bandage parallel with that of the turn below, reverse again at the proper point and so on. The reverses should be made so they lie in the center of the limb or to its outer side and all reverses should be in one line up the limb.

*The figure-of-8 bandage* is found specially useful about joints. It consists of a series of loops each overlapping the one below by about two-thirds the width of the bandage. The middle part

is over the bend of the joint while the loops lie one below the other above it. (Fig. 18.)

*The spica bandage* is a modification of the figure-8 bandage, having one loop much larger than the other.

**Precautions.**

In addition to those already mentioned, some other precautions must be observed in the application of the roller bandage:

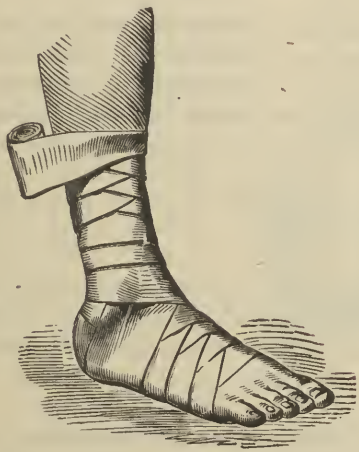


FIG. 18.—Figure-of-8 of foot. (*Heath.*)

Always bandage from below upward and always bandage from within outward, over the front of a limb.

Always bandage firmly, but never too tightly or loosely, and use firm, equal pressure throughout the bandage.

Always in bandaging a limb, leave the tips of the fingers or of the toes uncovered so that they may be seen. If the tips of the fingers or toes become blue and cold or if great pain is complained of it is

almost certain that the bandage has cut off the circulation and it must be loosened or dangerous results may follow.

Never reverse the bandage over a sharp bone and always use the figure of 8 over a joint.

Always place the part to be bandaged in the position in which it is intended to leave it, as otherwise change of position may result in cutting off the circulation by drawing the bandage too tight at some point.

Never put on a bandage under, but always over a splint.

Always in applying a bandage immediately after an injury remember that there may be swelling and use care in order that the bandage may not become too tight from this cause; always be ready to remove or to loosen a bandage when such swelling makes it too tight.

Never apply a bandage wet, for as it dries it will shrink and become too tight.

A very valuable exercise in the application of the roller bandage is afforded in bandaging the leg from the foot to include the hip. This gives an opportunity to practice all the methods of application which have been described.

The fact that lengths cut from the roller bandage prove useful in the hands of those unskilled in bandaging has already been mentioned. There are, however, three special bandages made in this way which are so simple and well suited to their special purposes that they should be known to anyone interested in bandaging.

1. **The Arm Sling** will be first described. For this a 3- or 4-inch roller bandage is required, preferably the latter. Bend the forearm on the arm at the angle at which it is desired to hold it, this is usually about a right angle. Put the end of the roller about midway between the forearm and shoulder and hold for a moment to

get length required when it may be allowed to drop. But before doing so pass roller in front and under forearm just in front of the elbow. Then carry roller along front of chest to the shoulder on the injured side, over this shoulder to back of neck, in front of sound shoulder, down to make loop for hand, back over sound shoulder, back of neck and in front of shoulder of injured side to starting point where length required will be cut off and the ends will be tied together. Two loops have, of course, been made, one for the forearm near the elbow and the other for the hand. (Fig. 19.)

Fig. 19.—Arm sling.

2. **The Four-tailed Bandage** is the second of these bandages. This is especially useful for fractures of the lower jaw and for injuries of the head. The 4-inch roller bandage is wide enough to make it for the former. It should be folded lengthwise in the centre and cut or torn in the fold so as to leave 2 or 3 inches in the middle of the bandage which, in applying the bandage, is placed over the chin. The lower ends are then carried up over the top of the head and tied there while the upper tails carried back are tied at the back of the neck. For injuries of the top of the head the four-tailed bandage made in this way from the 4-inch roller bandage will usually be found too narrow. It may, however, sometimes be used, especially if more space is left in the middle, or it may be made from two lengths of the 4-inch roller by sewing or even by pinning them together with safety-pins for the required distance in the middle. When available, a piece of cloth from

6 to 8 inches wide and 3 feet long should be used for this bandage. To apply it the middle of the bandage is placed on the top of the head, the two front ends are carried back and tied at the back of the neck and the two rear ends are carried forward and tied under the chin.

3. **The T Bandage** is the last of these bandages which demands our attention. It is used only for the crotch, especially to hold dressings on that part of the body. It is made from two lengths of a 3-inch roller bandage. To the centre of one of these, 1½ yards long, is sewed or pinned at right angles the other, which is 1 yard long. The bandage is applied by placing the long strip around the waist with the short one at the middle of the back. The long strip is then pinned in front and the short strip is brought forward between the legs to join the long one at the centre in front where it is pinned.

FIG. 20.—Four-tailed bandage of head. (*Stewart.*)

**Special Bandages.**—The only special bandage which need be mentioned here is the one supplied in the first-aid outfit of the American Red Cross. In each of these packets is found a long gauze bandage with a compress of gauze sewn to it in the centre, a triangular bandage printed so as to show how to apply it, and two safety-pins.

The directions, which are also found inside the metal case, are as follows:

*Gauze Bandage with Compress.*—If there is a wound or any injury in which the skin is broken, this bandage and compress are used by unfolding the bandage, **being careful not to touch the inner surface of the compress.** The compress should then be placed directly on the wound or injury, and held in place by wrapping the bandage around the limb in opposite directions and

tying it or pinning it in place. With a very large wound which the compress will not cover, apply it to the middle of the wound and wrap the bandage around as before. In this case be careful not to touch any surface of the bandage which is placed on the wound. In case there is no wound, this bandage may be used like an ordinary bandage to hold splints in place, etc.


FIG. 21.—Red Cross first-aid outfit.

*Triangular Bandage.*—The triangular bandage may be used as an outer bandage or as a sling in the manner pictured on it. This bandage should also be tied or pinned in place.

Do not touch an open wound with the fingers, water, or anything except the compress, or when very large the untouched surface of the bandage.

The pressure of the bandage will stop ordinary bleeding.

The advantages of this outfit are that the contents will always be clean and ready for use, the dressing can be easily applied, and not only does it contain a dressing, but also a sling. With it

and material for splints which may usually be easily found one is ready for any ordinary injury.

## COMPRESSES.

Compresses have already been spoken of in connection with the Red Cross first-aid outfit. A compress is simply something which is used to press on or, in other words, to cover an open wound.

FIG. 22.—Red Cross first-aid outfit—showing contents.

It should always be sufficient in size to do so with a lap of at least 1½ inches on all sides. Compresses should preferably be made of gauze or cheese cloth.

Above everything else they should be safe to apply to wounds. That is to say, they must have been properly disinfected in the first place, and in the second they must not be contaminated by the

FIG. 23.—How to apply Red Cross compress.

fingers or anything else in the handling necessary to apply them. (See Germs.) This is the great advantage of the Red Cross first-aid outfit, which is so prepared by the manufacturers that it is safe to put in direct contact with a wound and is then protected from accidental contamination by being enclosed in a sealed metal box. Moreover, the compress is so attached to its bandage that only gross carelessness in applying it will contaminate it then. A number of other first-aid packets are on the market which contain compresses that may be safely applied to a wound, though none is quite so easy to handle without accidental contamination as the Red Cross outfit. Each has printed directions on the box or container which must be carefully followed. If a first-aid packet can be procured it should always be used in preference to anything else to dress a wound. The next choice should be sterile or antiseptic gauze. Small packages of such gauze suitable for compresses may be bought in most drug stores, and are found in emergency cases. (Sterile gauze is ordinary gauze in which the germs have been destroyed by heat, and antiseptic gauze is ordinary gauze in which germs have been destroyed by an antiseptic, usually bichloride of mercury.) In a city, therefore, or if an emergency case is available, one may easily procure a safe compress and all he need do is to handle it so that he will not contaminate it. This may be accomplished by holding it not with the fingers, but by the paper which covers it, allowing only the inner surface of this paper to come in contact with the gauze and never removing part of the paper until it has served this purpose. If, by chance, the gauze is touched by the hand great care should be taken to drop the untouched part on the wound and to place the gauze which has come in contact with the hand as near the outer layer of the dressing as possible.

As discussed under the heading Germs, unless a safe gauze can be procured it is much safer to leave a wound exposed

FIG. 24.—How not to apply Red Cross compress.

to the air than to cover it, but this will not always prove practicable. It is especially in localities where no gauze can be procured that circumstances render it necessary to cover wounds. In such localities it may be hours before the services of a doctor can be procured, so an uncovered wound will be exposed for a long time to accidental contamination, which will be almost inevitable from the hands or clothing of the patient who must perhaps be moved. A compress, too, affords an excellent means of checking bleeding, being often all that is required for this purpose. Under such circumstances, therefore, it will be necessary to make a compress which, if not as safe as is desirable, is, at least, as good as can be procured. First, as surgically clean cloth for the compress as can be obtained should be used. This will be found in a towel, a handkerchief or other cloth of the same kind which has recently been laundered and has not been used since it was washed. Preferably, this cloth should be boiled for ten minutes or soaked in a solution of 1–1000 bichloride of mercury, corrosive sublimate, for an equal length of time. (Tablets of corrosive sublimate are in common use; they are known as antiseptic tablets. This substance is a deadly poison and its solution cannot be made in metal vessels.) The process recommended will give a compress which is safe to use, but an important practical difficulty is presented in applying such a compress to a wound. It will, of course, be so wet that it will not be possible to put it on the wound without squeezing some of the water out of it. To do this the compress must necessarily be handled and, as will be explained, pus germs exist in countless millions on the hands. If possible, therefore, the hands must be cleaned surgically, which means they should be freed of germs. This should be done by active scrubbing for five minutes with hot water, soap and a nail-brush, paying special attention to the nails. Preferably the hands should be washed under a tap instead of in a basin, and if a basin is used the water had best be changed two or three times. As a further

precaution, when corrosive sublimate is procurable, the hands after being washed should be soaked in a 1–1000 solution of that chemical for a period of five minutes. The hands must not be wiped and they must not touch anything except the compress. The piece of cloth which is intended for a compress may now be taken from the vessel in which it has been boiled or disinfected, but in so doing the operator should be very careful not to allow his hands to come in contact with that part of the compress which he intends to put on the wound. On the contrary, he should pick up the piece of cloth by its outer surface and, holding it at all times by this, squeeze the water from it until it is comparatively dry and then put it on the wound without delay. If a fairly large piece is taken for the compress and if, previous to boiling, or disinfection, it is folded so as to fit the wound it will be handled much more easily and safely.

When no facilities are available for washing and disinfecting the hands, naturally this must be omitted, but the same precautions should be taken in handling the compress. Suppose, however, that in addition the compress cannot be boiled or disinfected, and yet it is absolutely necessary to have one. In this case one should again take a towel, handkerchief, etc., which has just been laundered, and without unnecessary handling apply its inner surface to the wound. Towels, handkerchiefs, etc., which have been used or handled, though they may look clean, are never so in the surgical sense and are therefore particularly dangerous to use as compresses.

No attempt should be made to wash or to disinfect a wound. These are matters for the surgeon, and for him only in favorable surroundings and conditions. It is as unjustifiable for a student of first aid to wash or to attempt to disinfect a wound as it would be to probe it. If he leaves the wound undisturbed and untouched except with the safest compress that can be procured, he will have done his best and the patient should be greatly his debtor.

If he goes further than this he may be solely responsible for much unnecessary suffering and perhaps even for an unnecessary death.

## PLASTER, COLLODION AND SIMILAR SUBSTANCES.

These, of course, seal wounds on which they are used, so that if any pus germs have been introduced they are in the most favorable condition for doing harm. The use of plaster (except court plaster, to cover a trivial scrape not involving the entire thickness of the skin) must be absolutely condemned, for not only does plaster seal the wound, but it is also very likely not to be surgically clean.

Collodion is not surgically dirty, like plaster, and the ether which it contains has some antiseptic properties, so it is not really as dangerous as plaster. But it also may seal up germs under it. A good rule to adopt is to use it only on slight, cleanly cut wounds made by sharp instruments, and to have it removed by a surgeon if inflammation occurs.

## SPLINTS.

Splints are used to prevent movement at the point where a bone is broken. They must, therefore, be made of a stiff and rigid material. For first-aid purposes splints must generally be improvised from something which may easily be procured on the spot. Such articles are pieces of wood, broom handles, lathes, rules, squares, wire netting, heavy cardboard, umbrellas, canes, pick handles, spades, rolls made of blankets or cloth, pillows alone or with pieces of board outside, rifles, swords and bayonets. With a broken leg it is even posible to use the other leg as a splint.

In improvising splints a few precautions should be observed. Besides being rigid enough to prevent movement at the point where a bone is broken, they should be long enough to prevent movement at the nearest joints, as this will move the broken bone and they

should be as wide as the limb to which they are applied, as otherwise the bandages holding them on will press on the limb as well as on the splint and thus cause pain and perhaps displace the ends of the broken bone. On account of the danger from swelling and in order to promote the comfort of the patient and not to rub the skin, splints should be well padded on the inner side with some soft material. The clothing sometimes answers this purpose fairly well when it is not removed. Substances generally used are cotton batting, waste, tow, flannel, pieces of cloth, grass, etc. If splints are not well padded, the limb to which they are applied must be watched with special care because the swelling is likely to make the splints too tight which will cut off the circulation and may cause mortification.

## TOURNIQUETS.

Tourniquets are instruments used to stop bleeding from an artery. Each has a strap to go around the limb, a pad to place on the artery and some means by which the pad may be made to press on the artery and thus stop the flow of blood. In an improvised tourniquet, which is the type most commonly used, the strap may be made of a handkerchief, towel, bandage or cravat, and a smooth round stone, a cork or some object of similar shape and size may be used for the pad. The stone, etc., had best be wrapped in a small piece of cloth so that it will not bruise the skin too much. It is then placed over the artery above the wound and the strap is best passed twice around the limb and tied loosely at its outer side. A stick is introduced between the two layers thus formed and is twisted around until the bleeding is stopped. If desired, another bandage may be used to loop over and to hold the end of the stick from twisting back and so relieving the pressure of the pad on the artery. One layer of bandage may be used for the strap if more is

not procurable. In order to avoid bruising in using this it is best after introducing the stick into the loop to twist away from the body. This is illustrated under the heading Hemorrhage. The inner tube of a bicycle tire makes an excellent tourniquet. Its end is used for the pad.

Fig. 25.—U. S. Tourniquet.

Besides the bruising of the muscles and skin which is certain to occur to some extent with any tourniquet, there is a much graver danger connected with their use. This is due to the fact that in consequence of cutting off the circulation, mortification and death of the part may follow. If a tourniquet has been in place for an hour, therefore, it is desirable to loosen it and to allow it to remain loose if no bleeding occurs. It should not be removed as it may be necessary to tighten it again quickly should bleeding recommence. Whenever a tourniquet is used, a doctor should be sent for as quickly as possible, for if three or four hours pass with a tourniquet in place, mortification is very liable to follow.

Instead of tourniquets, appliances to make pressure on the whole circumference of a limb and thus to stop bleeding are sometimes employed. The strap which has just been described, without the pad, may be used for this purpose. A special elastic bandage and elastic suspenders have also been recommended. When possible, however, use the tourniquet, as cutting off the whole

circulation by pressure on the entire circumference of a limb is much more likely to cause mortification than the tourniquet, which presses to the greatest extent on the artery alone. If circular constriction is used it should not be employed for over an hour.

## HEAT AND COLD.

Heat employed externally is such a very valuable general stimulant that every first-aid student should know how to make use of it. The ordinary hot-water bag is most convenient for this purpose, but glass bottles and jars are good. They should be covered with cloth or paper to prevent them from burning the patient. Hot bricks and stones are also useful. In using heat in this way it must be remembered that, especially with an unconscious person, there is considerable danger of causing severe burns, so one must make sure by testing the bottle, etc., on his arm or face, that it will not burn even if left in contact with the skin for some time. In applying heat by means of the objects mentioned, to get the greatest effect, they should be placed between the legs, at their outer sides and between the body and the arms. A light hot-water bag lying over the heart acts as a special stimulant to it.

Heat applied locally causes the blood-vessels to enlarge momentarily and then to contract. Every one knows how shrunken the hands look after they have been in hot water for some time. For this reason heat may be used to prevent or to diminish swelling after an injury. Cloths wrung out in very hot water are usually employed for this purpose.

Cold as well as heat is used in first-aid work. It is employed for three important purposes: first, to reduce the temperature of the body in sunstroke; second, to contract the blood-vessels locally and, third, to stimulate the respiration or breathing.

While the full cold or ice bath is the best method of applying cold to reduce the temperature, cold may be utilized for this

purpose by placing bags filled with ice around the body. Sheets wrung out in cold or ice-water wrapped around the patient, may also be used.

Cold may be applied locally to contract the blood-vessels to prevent swelling after an injury. It always seems strange that the two opposites—cold and heat—should have the same effect on the blood-vessels, but this is actually the case. Cold is generally preferred to heat for this purpose, however, at least in all recent cases, such as those which are cared for by first-aid students. Ice bags, cold water running from a tap, cold water in a basin or pail or cloths wrung out in cold water are generally used. Cold metal, such as a wide knife-blade, sometimes proves a convenient means of applying cold especially to prevent black eye.

Everybody knows that on jumping into cold water or on being struck by a stream of cold water he involuntarily takes a deep breath. This effect of cold is taken advantage of to cause breathing to start when it has stopped or to quicken and deepen it if it is slow and shallow. For this purpose cold water should be sprinkled on the face—the front of the body, the chest and the abdomen are also particularly sensitive.

## STIMULANTS.

All stimulants taken internally are best given hot when possible as aside from the particular simulant used, heat itself is a powerful stimulant whether employed internally or externally. Safe and easily procurable stimulants are tea and coffee, a glass of wine, a dessertspoonful of whisky or brandy with an equal quantity of water, or a teaspoonful of pure alcohol with three times the quantity of water (not wood alcohol or denatured alcohol, which are poisons).

Alcohol in some form may usually be easily procured and this use of alcohol is, of course, purely a medicinal one which has nothing to do with the question of the habitual drinking of alcoholic

liquors. But many people object to the use of alcohol under any circumstances, and for other reasons it is not advisable to carry whisky or brandy for first-aid purposes. Aromatic spirits of ammonia which has none of the disadvantages of alcohol fulfils this need better than any other stimulant. It is best given in 20-drop to half-teaspoonful doses in one-third of a glass of hot water.

## EMETICS.

It is necessary to know a few simple and easy methods to cause vomiting.

Running the finger down the throat or drinking a large quantity of warm water are usually effective. A teaspoonful of mustard or salt in a cupful of warm water are household remedies of value and the wine or syrup of ipecac are usually easily procured. The last are given in doses of from one to two teaspoonfuls. An emetic will always work better if the patient drinks something before taking the emetic.

## QUESTIONS.

1. For what purposes are bandages used?
2. What precautions must be taken in applying them?
3. What are the three kinds of bandages?
4. Describe the triangular bandage. Of what is it made? What is its size?
5. What is the unfolded bandage?
6. What is the cravat?
7. For what purposes can the unfolded bandage be used? The cravat?
8. What are the uses of the roller bandage? From what is it made?
9. What are the sizes used for different parts of the body?
10. What precautions must you take in applying the roller bandage?
11. Describe the Red Cross first-aid outfit.
12. What is a compress?

13. What is necessary in compresses which are to be applied to wounds?

14. What precautions would you take in applying them?

15. How would you go to work to obtain a compress fit for application to a wound?

16. What is taught here in regard to disinfecting a wound?

17. What is a splint?

18. From what materials can a splint be made?

19. What precautions should you always take in applying splints?

20. What is a tourniquet? For what purpose is it used?

21. Describe the strap tourniquet with the pad, and the elastic constrictor.

22. What are the advantages of the former? What are the dangers from tourniquets?

23. How long is it safe to allow a strap tourniquet to remain in place; an elastic constrictor?

24. For what purposes may heat be used by the first-aid student?

25. How would you use heat to prevent swelling after an injury?

26. What are the dangers which may result from heat and how would you prevent them if you used it?

27. What uses can you make of cold and how would you use it?

28. For what purposes would you use stimulants?

29. Name some stimulants you would use and how you would give them.

30. What would you do in order to cause a person to vomit?

## PRACTICAL EXERCISES.

Show a triangular bandage. Show how it is used unfolded and folded.

Apply arm sling with bandage and with coat sleeve.

Foot bandage. Hand bandage; apply with cravat.

Eye bandage; jaw bandage; neck bandage; bandage for palm of hand.

Show roller bandage and apply it to leg and thigh.

Show arm sling with cravat.

Four-tailed bandage and "T" bandage.

Show Red Cross first-aid outfit and illustrate its use.

Show the method of applying a splint and a tourniquet.

## CHAPTER III.

## GENERAL DIRECTIONS FOR RENDERING FIRST AID. SHOCK.

### General Directions for Rendering First Aid.

In giving first aid several points must be taken into account. In case of accident when no doctor is present the man trained in first-aid work occupies for the time being the same position as a physician. For this reason in justice to his patient and to himself he must take control of matters. The only persons who should be near a patient are those actually needed to help him. Do not be hurried into moving a patient and always make sure first that he is not going to be injured by being moved. Broken bones must always be secured before a patient is moved.

If the services of a doctor are procurable it is best to send for one at once except for slight injuries.

Moreover, if any doubt exists in regard to the latter point, it is best to send for a physician or to take the patient to a doctor as soon as possible. It should be remembered that injuries and emergencies which are apparently trivial may sometimes, if not treated promptly by a doctor, have serious consequences, and that a physician called in time may with comparative ease prevent conditions which when fully established are beyond the help of medical science.

In approaching the patient do so calmly and without hurry. Be quiet and cool. Generally speaking, the first thing to do for the

patient is to get him into a safe and comfortable position. The best position, unless there is some reason to the contrary, is on the back with the head low. Never raise the head more than necessary to put a small pillow, such as one made of a folded coat, under it. With a flushed face, the head may be raised to this extent; with a pale face, it should not be raised at all. If a person is vomiting, he should be placed on his side or his head should be turned to one side, so that the matter vomited will not go into his wind-pipe and choke him. It should also be remembered that unconscious persons cannot swallow and so they should never be given water, stimulants, etc., as these will choke them by entering the wind-pipe. Slight cases of illness and injury may sit up, but one must be sure that all serious cases are kept in the lying position.

Tight clothing interferes with both breathing and circulation. The collar should be loosened at once and also usually the belt and suspenders.

A hurt person will frequently ask for water, which may be given him with perfect safety. Cold water is usually more refreshing, but whether cold or hot, it must be given fairly slowly so that the patient has time to swallow between sips. Stimulants have already been discussed. To neglect giving a stimulant when it is required would be a grave error of judgment. The first thought with many people, however, is to procure whisky or brandy for every sufferer from illness or injury. These are really as unnecessary for every case as would be the application of splints to the leg of every injured man. They should never be given in injuries of the head, and it should be remembered that while a small quantity of liquor acts as a stimulant, that large ones are depressing.

Whatever the injury may be, it must be seen clearly before any attempt is made to treat it. In order to do this it will generally be necessary to remove some of the clothing. This is likely to be

a very painful and possibly a dangerous process for the patient unless he is handled with the greatest gentleness. In removing clothing, rip up the nearest seam in the outer clothing and cut or tear the underclothing. The sound side should be undressed first so that the injured side will be subjected to less movement. In injuries to the foot and ankle it will rarely be possible to remove the boots or shoes without giving severe pain and perhaps doing considerable damage, so they should be cut freely when this is necessary.

## Shock.

More or less shock accompanies all injuries and it must always be thought of and treated when necessary.

**Description.**

Shock is a more or less profound depression of the nervous system. It is sometimes called collapse.

**Causes.**

Usually a severe injury. Some persons are sensitive to shock, however, and so with them more shock will follow a slight injury than is the case with a severe injury in less sensitive persons.

**Prevention.**

The prevention of accidents, especially severe accidents. Also do not allow an injured person to see his own injury, as this is apt to increase shock. This is especially true with severe bleeding.

**Symptoms.**

Usually appear immediately after an injury.

Patient is more or less stupid and takes no interest in what is happening near him.

May be partly or totally unconscious or mind may wander.

Face is pale, anxious and pinched; eyelids droop; eyes are dull, with dilated pupils.

Skin is cold.

Breathing is feeble and shallow.

Pulse is rapid and feeble and may not be able to feel at the wrist.

Usually patient gradually improves, in a few hours becoming more like himself, but may not do so, but die of heart failure.

**Treatment.**

Send for doctor immediately if possible. Combat depression and warm and stimulate in every possible way before arrival of doctor.

First, place patient on back with head low so that plenty of blood will enter brain.

Stimulants should always be given if patient is able to swallow. Hot coffee, hot tea or half a teaspoonful of aromatic spirits of ammonia in a tablespoonful of water. Whisky may be only stimulant procurable. If used, give one large drink only, as more is likely to cause depression.

Ammonia or smelling salts to nose help when procurable.

Never remove more clothing than necessary from an injured person as this will cause more severe shock, and when possible spread coats or blankets over him.

Place hot-water bottles or hot bricks around patient when possible; flannels wrung out in hot water applied to abdomen and chest have the same effect.

Rubbing legs and arms toward body, under blankets, quickens circulation and is useful. Be careful while doing this not to uncover patient.

**Warning.**

While shock is so extremely common in injuries that it should always be kept in mind and treated, it must not be forgotten that something more dangerous even than shock may require

attention. The symptoms of severe bleeding are very like shock, and if shock only is treated in such a case and the bleeding is not stopped the patient may very readily bleed to death.

## QUESTIONS.

1. Suppose you are called upon to care for an injured person. What would you do first?

2. What about moving an injured person?

3. When should you send for a doctor, or take the injured person to a doctor?

4. In treating an injured person what general measures would you take?

5. What about tight clothing?

6. What do you know about giving injured persons water; stimulants?

7. When would you remove some of the clothing and how would you do this?

8. When does shock occur?

9. What is shock? Cause of shock? Prevention? Symptoms? Treatment?

10. Suppose you see a person whom you think is severely shocked, what would you look for in order to determine nothing more severe than shock had occurred?

## PRACTICAL EXERCISES.

The application of all the bandages described in the preceding chapter by the members of the class.

## CHAPTER IV.

## INJURIES IN WHICH THE SKIN IS NOT PIERCED NOR BROKEN.

BRUISES, STRAINS, SPRAINS, DISLOCATIONS AND FRACTURES.

**Causes.**

These injuries are all caused by external violence in the form of blows or falls or by wrenching the body.

This does not apply to all compound fractures, however, as will be seen later.*

**Prevention.**

Every one is liable to these, the commonest of injuries, and they occur under so many different circumstances that it is impossible to suggest other than the most general means for preventing them. It is safe to say, however, that a great many of them result from carelessness and that especially in dangerous places, people should be more alive to their surroundings. In other words, they should always exercise common care.

Posted directions should always be observed. Such directions are not arbitrary, as they are, unfortunately, sometimes regarded, but represent the teachings of experience.

* Compound fractures are more conveniently described under fractures, though properly they are injuries in which the skin is pierced and first and foremost require the treatment of such injuries.

## BRUISES.

**Description.**

These are perhaps the most common injuries. When a person falls and strikes some part of his body or when he is struck by something, usually the skin is not broken, but the force of the blow or fall injures the tissues immediately beneath the skin breaking numbers of small blood-vessels therein. Blood escapes from these small vessels and this causes the swelling and the ordinary black-and-blue spot which is due to the blood which has escaped.

**Causes.**

Blows or falls.

**Prevention.**

As given above under general heading.

**Symptoms.**

Pain at once from injury to nerves.

Swelling from escape of blood from vessels.

Black-and-blue spot from same cause.

Pain also later from pressure of this blood on sensitive nerves.

Pain increased by movement.

**Treatment.**

Slight, no treatment.

More severe, object is to limit swelling and to decrease pain.

At once: Ice or very hot or very cold water, or half alcohol and half water. Arnica or witch-hazel. These contract blood-vessels and so prevent escape of more blood and also deaden the nerves to some extent, thus relieving pain. Ice may be applied directly to injured part. Best in using liquid remedy to wet cloth with liquid and then to apply cloth.

Raising bruised part diminishes pain, as it diminishes the blood-supply to the part.

In arm, when severe and movement is painful, use a sling.
No doctor is usually required for a bruise.

**Warning.**

A bruise may be only the least important part of an injury. So with a bruise always try to make sure there is no other injury, such as a fracture.

Bruises of the chest and abdomen sometimes result in internal injuries. They may be very dangerous from breaking of the blood-vessels of the lungs, of the abdominal organs, or from actual rupture of the soft internal structures. Severe bruises of this character therefore demand the immediate attention of a physician. In case shock is very severe after a bruise of the abdomen or chest, serious injury of the internal organs should be suspected.

## STRAINS.

**Description.**

A strain is the name given to the injury produced by over-stretching of a muscle. In severe strains small blood-vessels in the muscles are often broken so that blood escapes into the muscles in the same way that, with a bruise, blood escapes beneath the skin. The commonest strains are of the muscles of the back and shoulders and of the small tendons of the wrist and ankle.

**Cause.**

Usually a sudden wrench—may be due to lifting too heavy a weight.

**Prevention.**

As given above.

**Symptoms.**

Pain increased on movement.
Stiffness.
Lameness.
More or less swelling.

**Treatment.**

Not necessary to call doctor unless severe.
Absolute rest at first.
Alcohol and water, arnica and witch hazel gently rubbed in to deaden pain. Rubbing should always be toward body. Later such rubbing may be harder to help absorption and to make strained muscles more supple. When pain and stiffness have improved, gentle movement until both have entirely disappeared.

## SPRAINS.

**Description.**

Sprains are injuries of joints. They result from violent stretching, twisting and partial breaking of the ligaments about a joint and are sometimes accompanied by actual breaking of the bones. The twisting or stretching results in breaking of the blood-vessels and the escape of blood and of blood-serum (the liquid part of the blood) both around and in the joint.

Sprains of the wrist and ankle are most common.

**Cause.**

Unnatural movement of a joint. Sometimes the cause is apparently a slight one, such as twisting the foot in stepping down from a slight elevation.

**Prevention.**

See above under general heading.

**Symptoms.**

Severe pain immediately.

Pain is much increased by movement of the joint.

Swelling of joint.

Bones are not out of place and there is no deformity other than that due to swelling.

Shock, when severe.

**Treatment.**

Call doctor always when severe or when in doubt.

Always begin treatment at once whether doctor has been called or not.

Absolute rest in order not to do more damage by rubbing of the injured joint surfaces. This means that the patient should not be allowed to move the joint or to step on it.

Elevate joint when possible and apply heat or cold. Less blood will come to the injured joint if it is elevated and heat or cold contracts the vessels and thus limits the escape of blood and serum. Cold may be applied in the form of snow or crushed ice in a cloth. It is usually better to use cloths wrung out in very hot or very cold water or to shower the joint with very hot or cold water. Putting sprained joint under a cold or hot water tap is also excellent.

Either heat or cold should be made use of sufficiently long to get full benefit from it, that is to say, from 24 to 48 hours. At first on the application of either heat or cold, the pain may increase, but after an hour, at the latest, it will commence to improve and will finally disappear.

Remember there may be shock and, if so, treat.

**Warning.**

A severe sprain, especially a sprain of the ankle, is by no means a trivial injury but one which demands the services of a physician.

## DISLOCATIONS.

**Description.**

Dislocations are injuries of joints and are due to the head of a bone slipping out of its socket. A dislocation cannot occur, except in a joint which has been dislocated before, without tearing the ligaments which keep the joint close. Some persons, however, on account of frequent dislocations of the same joint have its ligaments so stretched that not only is dislocation easy, but no further injury of the ligaments results from it. By far the most frequent dislocation is that of the shoulder-joint, which occurs in one-half of all cases of dislocation. But dislocations of the hip-joint, the jaw and the fingers are not particularly uncommon.

**Causes.**

Dislocations are usually caused by a blow or a fall, but sometimes result from a violent muscular effect, such as throwing a stone.

**Prevention.**

As given under general heading.

**Symptoms.**

Deformity; that is, the joint has an unusual appearance, because the head of the bone is not in its proper place. This may be best recognized by comparing the injured with the uninjured side of the body.

The limb in which a joint is dislocated may be either longer or shorter than the uninjured limb. This depends on the direction in which the dislocation has taken place. The head of a dislocated bone may often be felt out of its place. Limited movement as the displaced head of the bone is tightly held in its new position.

Pain from pressure of the displaced head of the bone on sensitive nerves.

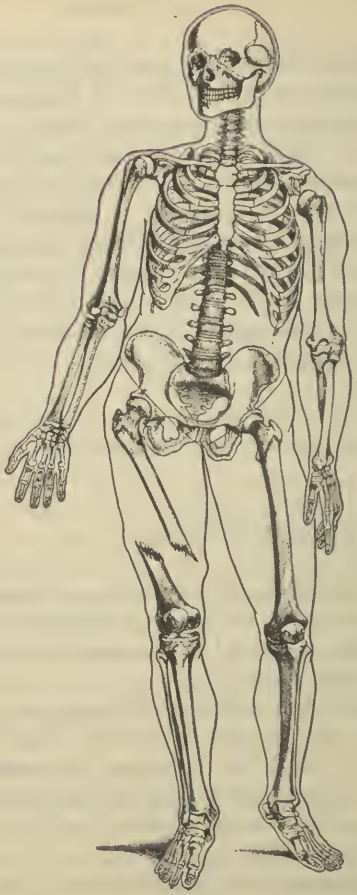


FIG. 26.—Dislocation and fracture.

Swelling from bruising of the soft parts by the displaced head of the bone.

Shock.

**Treatment.**

Send for a doctor at once.

Await his arrival except in dislocations of the jaw, the fingers and the shoulder without attempting to reduce dislocation.

Remember that attempts to reduce dislocations, other than those of the finger and jaw, by one not familar with anatomy may result in great harm to the patient, for the movements necessary to do so may cause serious injury to the blood-vessels, nerves and soft parts.

When no attempt is made to reduce the dislocation, the patient should be put in a comfortable position and the injured joint should be covered with cloths wrung out in very hot or very cold water so as to contract the vessels and to prevent swelling as much as possible.

## Dislocation of the Lower Jaw.

This may usually be successfully treated by almost anyone. This is fortunate, as a dislocated jaw with the open mouth in consequence is most painful and uncomfortable. To reduce a dislocation of the jaw, both thumbs must first be wrapped in several layers of cloth so that they will not be liable to injury. Both thumbs are then placed in the patient's mouth resting on his lower teeth on each side while the fingers seize the lower jaw outside. First pressure is made downward and then backward. As soon as the jaw starts into place the thumbs should be slid off the teeth to the inside of the cheeks or they will be caught between the teeth when the jaw springs into place. The overstretched muscles act just like a rubber

band and one must be quick or his thumbs will be injured. When dislocation is reduced put on jaw bandage.

### Dislocation of the Fingers.

These, not including those of the second joint of the thumb, present no great difficulties to the first-aid student. The dislocated finger should first be grasped firmly on the hand side. The end of the finger should then be pulled straight out away from the hand and the bone will usually slip into place. No bandage will be required.

### Dislocation of the Shoulder.

No attempt should be made to reduce this dislocation if the services of a physician can be obtained within a reasonable time, say four hours. Make your decision on this point at once, for if you are compelled by circumstances to attempt to reduce the dislocation you must get to work immediately before the muscles have become set and rigid from the irritation caused by the displaced head of the bone.

Frequently little difficulty will be experienced in reducing a dislocation of the shoulder, especially if the joint has been dislocated before. To accomplish it, the patient should be made to lie down flat on his back. The person who is going to try to reduce the dislocation should then sit down beside him on the injured side facing toward his head and should place his inner heel, after the shoe has been removed, in the arm-pit of the patient's injured side and then draw down the dislocated arm and drag it toward the uninjured side at the same time pressing outward and upward with the heel. This will usually pry the end of the dislocated bone outward, and as soon as it is free it will snap back into place. In order to

keep the bone in place, the arm should then be bandaged to the side with the forearm carried across the chest and the hand placed on the opposite shoulder.

**Warning.**

In case much difficulty is experienced in reducing any dislocation, do not persist in attempts to do so.

## FRACTURES.

**Description.**

When a bone is broken, the injury is called a fracture. Our bones are brittle and when the force used against them is sufficient they break much as would a dry stick. Fractures are among the commonest injuries, ten times as common as dislocations. About two-thirds of all fractures are of the bones of the limbs. Next in frequency are those of the collar-bone and ribs. Fractures of the skull, spine and pelvis are comparatively rare.

A simple fracture is one in which the skin is not pierced.

A compound fracture is one in which the skin is pierced.

**Causes.**

Simple: blows and falls. Compound: also,—from bad handling of simple fractures and from wounds.

**Prevention.**

Simple: as given under general heading. Compound: also,—by proper handling of simple fractures and the prevention of wounds.

**Symptoms. Simple Fracture.**

History of blow or fall.

Pain at point of fracture.

Tenderness at point of fracture.

Person injured is unable to move fractured limb.

Deformity. With a fracture a limb will be altered in shape

and shortened or bent. Always compare with the uninjured side.

Recognition by touch,—an inequality may often be felt by running finger along a broken bone.

Loss of rigidity of bone. On moving a limb in which bone is fractured, instead of the bone being moved as a whole it will be noticed that at the point of fracture there is unusual movement, something like that of a hinge.

Crepitas. This is the surgical term applied to the grating which is heard or felt when the broken ends of the bone are rubbed on each other.

Shock.

**Warning.**

As one may do great harm by moving a broken bone, for the broken ends are likely to be very sharp, it is much safer when an injured person is unable to move a limb, and from appearances it seems probable that a fracture has occurred, to conclude that it is a fracture without further examination, and to so treat it.

**Treatment. Simple Fracture.**

Send for a doctor.

The object of treatment before his arrival is to prevent further injury, especially puncture of the skin by the sharp, knife-like edges of the broken bone. If this occurs the simple fracture is, of course, converted into a compound fracture. In the former injury there is no chance of wound infection as the unbroken skin prevents germs from reaching the break in the bone, while in the latter the skin is cut through and in consequence germs reach the broken bone ends and infection occurs. So instead of the few weeks of comparatively painless healing of the simple fracture without much danger, a compound fracture is caused with probable wound infection,

inflammation, pus or matter, and perhaps months of sickness from blood-poisoning, with considerable danger of death. In the treatment of simple fractures the primary object is accomplished by preventing movement of the ends of the broken bone.

If the doctor may be expected to arrive promptly, nothing need be done except to put the patient in a comfortable position. If it is evident that in order to do this the broken bone will be moved, it must be supported firmly by the hands. One hand should support the broken bone on each side of the break. The bone must not bend at the break while the patient changes his position to a more comfortable one. Then the broken bone had best be supported in the natural position on a pillow or a folded coat. In so supporting it great care must be taken that it is not bent or does not drag on the point of fracture.

If the patient must be moved more than slightly, as just described, the broken bone should be set; that is to say, it should be gently drawn into its natural position, always determining this by comparing it with the opposite side, and held there firmly by the application of splints.

If the injured person is wearing thin summer clothing, it will not usually be necessary to remove the clothing in order to examine for fracture. In fact, it will be better not to try to do so, as this may result in injury from moving the sharp ends of the bone, and when the clothing is left on it furnishes excellent padding for splints. With thick clothing, however, very likely one will not be able to tell that a fracture has occurred or what the character of the injury is. In this case never try to take off the clothing, but cut it in the seams with a sharp knife or scissors.

Treat shock.

**Symptoms. Compound Fracture.**

Besides the symptoms already described, there is a wound leading down to the broken bone, or the broken end of the bone protrudes through the skin.

**Treatment. Compound Fracture.**

Send for doctor.

Expose fracture by cutting clothing.

Turn back clothing from wound.

Use same precaution as in simple fracture to prevent movement of sharp ends of broken bone.

Do not touch wound with fingers or anything else.

As soon as possible procure an antiseptic or surgically clean compress and place it on the wound.

If sharp bone is buttoned-holed through the skin, as frequently happens, do not attempt to restore it to its place, but by padding splint hold it in position as it is.

Always treat wound first, then fracture.

Treat shock.

**Warning.**

Never in any fracture attempt to transport patient until the broken bone is firmly fixed in position by splints.

### Fracture of Lower Leg.

**Symptoms.**

As given above. Patient falls to ground. Is not usually difficult to detect fracture.

**Treatment.**

Send for doctor.

Secure pillow, sack stuffed like pillow with hay, straw or the like or a blanket rolled on poles at each side so as to make trough.

Gently lift the leg to pillow, etc., placing one hand above and

the other below break under leg, always holding in natural position.

Leg on pillow, should not allow toe to turn in or out, but

FIG. 27.—The pillow splint. (*Dulles.*)

should be supported in same position as toe of uninjured leg. Nothing further unless must move patient. If this must be done the leg should be drawn into natural position and splinted.

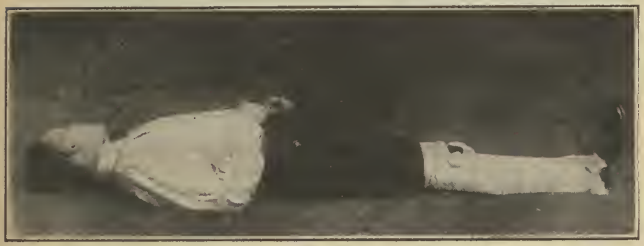


FIG. 28.—Splints for fracture of lower leg.

Use two splints when procurable. Though any stiff material may be used for these splints, preferably they should be of thin boards longer than the leg so as to prevent movement

at the knee-joint, and wider than the leg is thick. The splints should be applied outside of pillow, one at the inner and the other at outer side of leg. They should be held in place by 3 or 4 strips of cloth, straps or handkerchiefs passed around splints, pillow and leg and tied. Care must be taken that none of these strips is directly over break, as this will cause intense pain by pressure. The pillow alone makes a fairly good support even without splints. Splints also may be used without a pillow. If this is done the clothing, straw, hay, cotton, leaves or something else soft must be used for padding under the splints, which are tied in place in the way described above. In case of emergency anything stiff of sufficient length, such as

FIG. 29.—Splints for fracture of thigh.

a cane, umbrella or the like, may be used for the outer splint, the other leg being used for the inner splint. The strips of cloth or handkerchiefs are then passed around the splint and both legs and tied as before.

Treat shock.

## Fracture of Thigh.

**Symptoms.**

As above, patient falls to ground.

May be difficult to detect fracture on account of thick muscles.

**Treatment.**

The necessity of procuring a physician and of treating shock are greater than in fracture of the leg. Remarks in reference to careful handling of broken bone apply.

If difficult to detect fracture, treat as fracture.

A long splint extending in a solid piece from foot to arm-pit is required for outside splint to prevent movement of hip-joint. This should be firmly fixed by encircling strips of cloth to the chest as well as to the limb.

Inner splint had best extend from crotch to foot. If no inner splint can be obtained, tie legs and thighs together.

## Broken Knee-cap.

**Symptoms.**

As above, patient falls to ground and cannot raise leg.

Not difficult to detect fracture, as can feel groove in knee-cap immediately beneath the skin.

**Treatment.**

Services of a physician will be required and shock generally demands treatment. Must also use care in moving leg.

Straighten leg.

Secure splint long enough to extend from middle of thigh to middle of lower leg. Preferably, this should be a thin board as wide as thigh, but a cane, umbrella or the like may be used in case of emergency. Make pad for splint, apply splint to back of thigh and leg with middle opposite bend of knee and tie in place with strips of cloth or handkerchiefs. Be careful not to put bandage over break, but one strip immediately above and one immediately below knee.

## Fracture of Collar-bone.

**Symptoms.**

Patient supports elbow of injured side with hand of other side.

Is unable to raise arm above shoulder.

Is easy to feel depression by running finger over injured collar-bone.

**Treatment.**

Send for doctor.

Make pad from a large handkerchief, two medium-sized handkerchiefs, a triangular bandage or the like.

FIG. 30.—Dressing for fracture of collar-bone.

Place this pad in arm-pit of injured side. Put arm in sling with forearm at right angle to upper arm.

Take a bandage about 3 inches wide, put this horizontally around body and injured arm at elbow. It will, of course, encircle both the elbow, the bent arm and the body. When tied by pulling elbow to body it will force upper end of humerus outward.

Another method:

Have patient lie down and place his injured shoulder on pillow in a comfortable position till doctor arrives.

Treat shock.

## Fracture of Upper Arm and Forearm.

### Symptoms.

These fractures can almost always be easily detected by the symptoms already given.

FIG. 31.—Fracture of upper arm. (*Drill Regulations, H. C., U. S. A.*)

FIG. 32.—Splint and sling for forearm. (*Drill Regulations, H. C., U. S. A.*)

### Treatment.

Send for doctor.

Treat shock.

Gently straighten limb so as to put it in natural position.

Secure two splints long enough, in upper arm to extend from shoulder and arm-pit to elbow, and in forearm from elbow to

middle of hand. These are best flat boards, shingles are excellent, but may be of any stiff material, such as twigs, cover of wine bottles, tin trough, etc.

Pad splints well.

In upper arm, if lower part of bone is broken, apply one splint behind and the other in front. If fracture is of middle or upper part, apply one splint to inner and the other to outer side of arm.

Support by sling.

In forearm:

Place forearm across the chest, thumb up.

Apply one padded splint—clothing will do for padding—to outer side from elbow to beyond wrist and the other to inner surface extending to tips of fingers.

Support by sling.

### Broken Wrist.

This is an extremely common injury resulting from falls on the hands which are put out in falling forward to protect the body.

**Symptoms.**

This belongs to a class of fractures to which the name impacted is given. The force of the injury actually drives one bone into the other so that they are held together.

Great deformity, no crepitas, movement, etc.

**Treatment.**

Send for doctor.

Do not attempt to free bones, but leave them as they are.

Otherwise treat like fracture of forearm.

### Broken Fingers.

**Symptoms.**

Usual symptoms of fracture, which is easily detected.

**Treatment.**

Gently draw into natural position.

Put narrow padded splint under finger and hold it in place with a narrow bandage.

Support hand in sling.

Show to doctor as early as practicable

## Fracture of Ribs.

**Symptoms.**

Sharp pain on taking a long breath or coughing. Breathing is usually short, patient often presses hand to side to prevent movement of chest.

May feel grating of ends of broken bones on each other by placing hand on chest at point where pain is most severe.

**Treatment.**

Tie a large handkerchief or a triangular bandage firmly around the chest, pin a large towel snugly around chest or apply a roller bandage to chest. These limit chest motion and thus diminish pain.

If shock is severe, call doctor immediately. If not, after bandage is in place may visit a doctor as soon as practicable. Treat shock.

## Fracture of Skull.

**Symptoms.**

Patient probably unconscious from injury to brain. If at base of skull, there will probably be a discharge of blood from nose, ears or mouth. If at vault, fracture can easily be detected under skin.

**Treatment.**

Send for doctor.

Place in lying-down position with head slightly raised and keep very quiet until doctor arrives.

## Fracture of Lower Jaw.

**Symptoms.**

Mouth open, patient cannot speak.

Fracture may often be felt outside, and inside there will be an irregularity of the teeth.

May be bleeding from gums.

Shock.

**Treatment.**

Send for doctor.

Gently raise broken jaw and bring lower against upper teeth.

Support in this position with the jaw bandage described on page 25 or with two strips of bandage, one vertical, tied over top of head and the other longer, brought to back of head, crossed and brought horizontally to forehead and tied there.

Treat shock.

## Fracture of Nose.

**Symptoms.**

Usually not difficult to detect.

Pain, swelling, crepitas and deformity. Swelling may be so great that obscures deformity.

Is not infrequently compound.

**Treatment.**

Put in as natural position as possible and hold there with an adhesive-plaster strip across nose from cheek to cheek.

Before applying plaster, put a small compress of gauze on each side of nose.

If you have no adhesive plaster put on bandage over nose and around head, but do not pull tight enough to flatten nose.

Consult doctor, as there is danger of permanent deformity.

## Broken Back.

**Symptoms.**

Patient unable to move.

No motion or feeling of body below injury.

**Treatment.**

Send for doctor at once. If possible, do not move patient before his arrival.

If patient must be taken from the spot where his injury has occurred, procure ample assistance to lift him. This should be done with the greatest care so as not to bend spine for this will crush spinal cord.

Put stretcher under patient and gently lower him to stretcher.

Treat shock.

## QUESTIONS.

1. What are the common causes of injury without a break of the skin?
2. How may such injuries be prevented?
3. Describe bruises.
4. What are the symptoms of bruises?
5. How would you treat them?
6. In a severe bruise what else must you look out for?
7. What is a strain? How is it caused? What are the symptoms?
8. What is the treatment?
9. What is a sprain? How is it caused? Symptoms? Treatment?
10. Is a severe sprain a slight injury?

11. What is a dislocation?

12. How are dislocations caused? Symptoms? Treatment?

13. Under what circumstances would you be justified in trying to reduce a dislocation?

14. When should you proceed to do so?

15. Danger of attempts to reduce dislocations.

16. Describe special treatment for dislocations of the lower jaw, finger and shoulder.

17. What is a fracture?

18. Are fractures common accidents as compared to dislocations?

19. What is a simple fracture?

20. What is a compound fracture? Causes of simple fractures and compound fractures?

21. How would you prevent a simple fracture from becoming a compound one?

22. How would you recognize a simple fracture in an injured person?

23. How would you treat a simple fracture?

24. How would you recognize a compound fracture?

25. Treatment of compound fracture?

26. Symptoms and treatment of fracture of the lower leg; the thigh; of knee-cap; of collar bone; of upper arm and forearm; of wrist; of fingers; of ribs; of skull; of lower jaw; of nose; of back.

## PRACTICAL EXERCISES.

Show methods of treatment of dislocations of lower jaw, shoulder and fingers.

Show methods of treatment of a simple and of a compound fracture.

Show treatment and application of splints in fracture of lower leg; the thigh; the knee-cap; collar-bone; upper arm and forearm; wrist; fingers; ribs; skull; lower jaw; nose; back.

CHAPTER V.

## INJURIES IN WHICH THE SKIN IS PIERCED OR BROKEN.

Injuries in which the skin is broken or pierced are commonly called wounds.

**Description.**—In a wound not only is the skin broken or pierced, but there is usually more or less damage to the tissues beneath it. This serves to distinguish wounds from the injuries which have just been described (except compound fractures, which are really wounds) for with the former the injury is confined to the tissues underneath the skin. In wounds, as the protective covering, the skin, is broken through, there is danger of the entrance of pus germs and consequently of inflammation with the formation of matter or pus. In wounds, too, as some blood-vessels must be injured, there is more or less hemorrhage or bleeding.

It is very important for the first-aid student to understand clearly the action of germs which enter the body through a wound. These germs are vital or, in other words, living organisms. While with injuries from mechanical and chemical agencies the damage to the body is done at once at the time the injury is received, with injuries from vital agencies this is not the case. No effect is apparent at the time of the injury, but the damage comes later with the growth of the living organisms.

The germs which we need consider can only enter the body through a wound or a break in the skin. These germs which are too small to be seen except through a powerful microscope cause inflammation and the formation of pus, or matter. They exist

in countless millions, but they do not live in the tissues of our bodies and must, therefore, always enter from outside. This is a most important fact to remember. It is also important to know that pus germs do not float in the air and so cannot be carried to a wound from the air. Pus germs are found on the surface of our bodies, on knives and other objects which cause wounds, in the dust of houses, in water, etc., and also on surgical instruments and dressings unless special means have been taken to free them of germs or, in other words, unless they have been disinfected.

Suppose a wound is received, what happens? If pus germs do not gain entrance to it, there will be no inflammation and it will heal quickly and kindly; but if, on the other hand, the wound is infected by pus germs, this means that inflammation will follow, more or less matter will form, and there will be some absorption of poisonous products from the wound which may result in the more severe forms of blood-poisoning and almost inevitable death. But as pus germs are so generally present, it may appear that under ordinary conditions they would always be carried into a wound when it is received, either from the surface of the body or by the object which causes the wound. This is true, but if only a few pus germs are carried into the tissues they will dispose of the germs without trouble and no harm will result; moreover, unless too many pus germs are carried into the body, the blood resulting from the injury will often wash so many out that the tissues can dispose of the few left with little difficulty. This is exactly the reason why a wound which bleeds freely is less likely to prove dangerous. We may assume, then, that every wound is not contaminated and must use every care not to contaminate it by our hands, by instruments, dressings, etc. This is best accomplished by covering it with a disinfected dressing, as this will prevent contaminated articles from coming in contact with it. (See Compresses, page 36). But if no such dressing is available, it is best,

when possible, to leave it exposed to the air, for, as has been stated, little danger of contamination is to be feared from the air. Ordinary water is dangerous as it may contain many pus germs.

The symptoms of inflammation in a wound are heat, redness, pain, swelling and partial or complete loss of use of the wounded part. If these appear in a wound three or four days after an injury, unless they are slight a doctor is necessary, as they may grow much worse.

## Varieties of Wounds.

1. Cut or incised wounds, in which the skin and underlying tissues are cleanly divided by a sharp instrument. They are caused by razors, sharp knives, glass and the like. To prevent them as with the former class of injuries common care should be exercised. In this variety of wounds, as blood-vessels are cleanly cut across, there is likely to be severe bleeding.

2. Torn or lacerated wounds, in which the tissues are torn rather than cut. They are caused by a tearing or crushing injury, such as the blow of a blunt instrument, by machinery or by being run over or struck by a wagon, trolley or railway car. As a means of prevention, attention need be called only to common care. With them, as the blood-vessels are crushed as well as the other tissues, hemorrhage is not nearly so likely to occur as in the preceding variety, but on account of the character of the injury, dirt is likely to be ground into the tissues and they are so extensively torn and destroyed that infection followed by inflammation and matter or pus is extremely common.

3. Punctured wounds are deep wounds of small calibre produced by sharp-pointed instruments, such as daggers, bayonets and the like. Wounds caused by bullets are also included in this class. Wounds of this variety are, of course, frequently purposely inflicted, but the great majority of bullet wounds in civil life result from

carelessness which is almost, if not quite, criminal. "I didn't know it was loaded" is not sufficient excuse for shooting a fellow-being, and if one observes the rule of never pointing a gun or pistol at himself or at anyone else he will have no occasion to make this excuse. The amount of bleeding in this variety of wounds is often slight, but may be great if a large blood-vessel is injured. Infection is not uncommon, as pus organisms when carried into such wounds have ideal conditions for multiplication.

**Symptoms of Wounds.**

Presence of the wound.
Pain.
Shock.
Hemorrhage.

HEMORRHAGE: Practically all wounds bleed more or less, but comparatively few are accompanied by dangerous hemorrhage, as large blood-vessels usually escape injury. Besides the actual appearance of blood in hemorrhage, the loss of a considerable amount of blood gives rise to certain symptoms: Faintness, with cold skin, pale face, dilated pupils, feeble, irregular breathing, sighing, weak pulse, dizziness and loss of consciousness. The severity of the symptoms depend on how much and how rapidly blood is lost.

**Treatment of Wounds.**

This had best be considered under two headings:

1. Treatment of wounds without severe hemorrhage, and
2. Treatment with wound with severe hemorrhage.

1. **Treatment of wounds without severe hemorrhage.**

In deep wounds or those which cover a considerable surface, always send for a doctor at once. It is always better to call in a physician if you doubt your ability or resources.

Cut or rip clothing so as to get a view of the wound.

Turn back the clothing so it does not touch wound.

Do not touch wound yourself nor allow patient to touch it. Remember there is no hurry, for air will not infect the wound. If a physician may be expected to arrive within a few moments, it will usually be necessary to do nothing further.

Exposure to the air is much safer than the application of anything which is not surgically clean or antiseptic. If, however, you have a surgically clean or antiseptic compress—apply it to the wound at once and bandage firmly into place. This will prevent accidental contamination and will usually stop any bleeding there may be. In fact, this procedure will stop hemorrhage in ninety-nine per cent. of all wounds.

Treat shock, if any.

If patient is faint, always have him lie down with his head low.

With trivial wounds, such as scratches, it is much better to encourage bleeding than to try to stop it.

Do not suck such wounds, but by pressure at their sides make them bleed. In the fingers this is best done by milking the finger.

Do not wipe off the blood unless you have a surgically clean cloth with which to do so. This is the only class of wounds in which water may be used to wash off the blood. The danger of contaminating these small wounds by water is very slight and the matter washed away by the water is much more dangerous than the water itself.

A piece of clean gauze makes a good dressing.

2. **Treatment of wounds with severe hemorrhage.**

Check the bleeding.

Put patient in such a position that he will be least affected by the loss of blood. This is lying down with the head low so that the brain will get as much blood as possible. Do nothing which will increase bleeding. Violent movements must be prevented. When once the bleeding has ceased the patient

should remain quiet, as any movement may dislodge the clot and start it again. See that the patient gets plenty of good air, cover him warmly and put hot bottles around him if they can be obtained. Naturally, stimulants increase the force of the heart, so they are undesirable; but sometimes the patient becomes so weak that it is absolutely necessary to give them to prevent him from dying. Whenever possible, always avoid doing so until the bleeding has been checked by some mechanical means. One-half teaspoonful of aromatic spirits of ammonia in a tablespoonful of water or a tablespoonful of whisky are good stimulants.

In order to check the bleeding it is necessary to know from which kind of vessels it comes.

1. Arterial hemorrhage is recognized by bright red blood expelled in jets. The blood is lost very rapidly.

2. Venous hemorrhage is recognized by a steady flow of dark blue blood.

3. Capillary hemorrhage is characterized by the oozing of blood of a brick color.

Hemorrhage will not be severe except from arteries and large veins.

Naturally, as arteries, capillaries and veins may all be cut in a wound, there may be bleeding from all three. In this case arterial hemorrhage demands first consideration, and with venous and capillary hemorrhage the latter may be disregarded for the time being.

### Arterial Hemorrhage.

**Treatment.**

Send for a doctor at once.

Do not wait for him, for by so doing the patient may die or be in a hopeless condition when he arrives.

If necessary, cut off clothing at once so as to see bleeding point. In very severe hemorrhage proceed with next step before doing this.

Press with your fingers or thumb on the artery between the bleeding point and the heart. This stops the bleeding just as you can check the water flowing from a hose by pressure in any part of its length. It does more than this, however. Nature's method of checking hemorrhage is by the formation of a clot, and as pressure prevents the washing away of the blood beyond the point of pressure an opportunity is given for a clot to form.

The points where pressure can best be made on arteries in their course have already been given, but it will be best to review this subject so far as the principal points where pressure can be most effectively made with the fingers or thumb, etc., are concerned:

The temporal artery which furnishes the most dangerous bleeding in scalp wounds is reached by pressure in front of the ear just above where the lower jaw can be felt working in its socket. A branch of this artery crosses the temple on a line from the upper border of the ear to above the eyebrow. Either of these points can be used for bleeding above on the same side of the head. Bleeding from any part of the scalp may be stopped by a tight bandage around the head. This bandage should encircle the head, going across the forehead just above the ears to the base of the skull behind.

The carotid artery may be compressed by pressing the thumb or fingers deeply into the neck in front of the strongly marked muscle which reaches from the upper part of the breast-bone to behind the ear. Figure 33 shows pressure on the carotid on the left side. All bleeding from the head, except from the side above, which has already been referred to, had

best be checked by pressure on the carotid artery. Wounds of the neck whether from arteries or veins are so immediately and extremely dangerous, however, that direct pressure on the bleeding point should be resorted to at once.

In bleeding from wounds of the shoulder or arm-pit, the subclavian artery may be reached by pressing the thumb deeply into the hollow behind the collar bone. (Fig. 34.) In

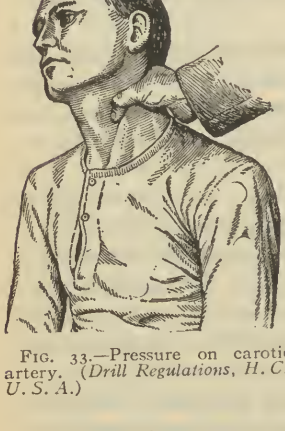


FIG. 33.—Pressure on carotid artery. (*Drill Regulations, H. C., U. S. A.*)

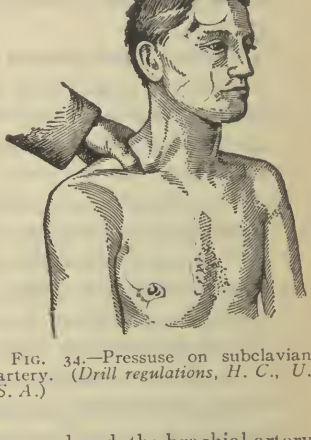


FIG. 34.—Pressuse on subclavian artery. (*Drill regulations, H. C., U. S. A.*)

bleeding from any part of the arm or hand, the brachial artery should be pressed outward against the bone just behind the inner border of the large muscle of the upper arm. (Fig. 35.) While bleeding in the palm can be checked in this way direct pressure by means of a stone wrapped in gauze or the like firmly bandaged in the palm with the hand closed upon it is much better.

In bleeding from the thigh, leg or foot, press backward with

the thumbs at the middle of the groin where the artery passes over the bone. (Fig. 36.)

In making pressure with the fingers, if you feel the beat of the artery, you can be quite sure that with a little care to get it between your fingers and the hard point you can check the bleeding. If you have stopped the bleeding in the manner just described, you may also be quite sure that the patient is safe so long as you continue the pressure.

FIG. 35.—Pressure on brachial artery. (*Drill regulations, H. C., U. S. A.*)

You will hardly be able to do this for more than ten or fifteen minutes, however, as your fingers will become tired and cramped. It will be best, therefore, in wounds of the extremities to have a tourniquet made to place around the limb against your fingers with the pad on the artery; the tourniquet then to be twisted. Tourniquets are described on page 43. Another method which gives the same results as a tourniquet may be used in bleeding below the knee or elbow. In either a good-sized pad made of gauze or a

roll of cloth should be put in the bend of the joint and the joint bent together and tied in this position with a bandage or a strip of cloth so that the pad makes pressure on the artery in the joint angle.

One of these methods will usually be all that is necessary if the services of a doctor can be produced within two or three

Fig. 36.—Pressure on Femoral Artery.

hours. If this is not the case you will be in a serious position. If either apparatus is left in place much longer than this there is considerable danger from cutting off the blood-supply that you will cause the death of the part below. No part of the body can do without blood for a long period, and yet if the pressure is removed the bleeding may recommence. Under

FIG. 37.—Tourniquet Applied to Brachial Artery.

such circumstances, therefore, leave the tourniquet or pad in position as long as you dare, say two hours. In the meantime procure an antiseptic compress or have one prepared in the manner already described. Place this gently on the wound and bandage firmly in place so as to make strong pressure on the

Fig. 38.—Tourniquet Applied to Femoral Artery.

bleeding point. The pressure between the heart and the wound may now be gradually released. If the bleeding does not recommence, well and good; if it does, the tourniquet or pad must be reapplied. Another attempt to remove it should not be made for at least an hour, as time is needed for the clot to reform.

Suppose, at first, and this is by no means improbable, that

you have failed to stop the bleeding by pressure between the heart and the bleeding point—there is still no reason why you should become panicstricken. Of course you do not want to put your fingers in the wound as this will be very likely to infect it, but in case of a severe arterial hemorrhage which you are unable to check by pressure between the heart and the bleeding point you must at once make pressure on the cut artery in the wound. If you have an antiseptic compress or a surgically clean cloth to put over your fingers, which are used to make direct pressure, so much the better, as this will prevent infection; but do not wait to obtain it. When direct pressure is made in this way, it should be replaced, if possible, by a compress bandaged in place in the manner which has already been described.

With wounds of the smaller arteries if a compress is firmly bandaged in the wound at the beginning it will often be all that is required to check bleeding. Position is also of value in stopping such hemorrhage. By elevating the arm or leg the heart is made to pump against gravity and a much better chance is given for a clot to form, which will block the injured artery.

## Venous Hemorrhage.

(Large Veins.)

**Treatment.**

Stopping bleeding of this character is rather simple as compared with checking arterial hemorrhage.

Send for a doctor.

Remove any bands, such as tight collars, belts, garters and clothing which prevent the return flow of blood to the heart.

If a limb be wounded, elevate it so as to assist the flow of blood back to the heart.

Apply a compress directly to wound and bandage on tightly.
If no compress can be obtained which is surgically clean or antiseptic, if bleeding is very severe it will be necessary to make direct pressure in the wound with the fingers.
This will, of course, be done at the risk of infecting the wound.
If possible, keep wounded part in an elevated position for some hours after bleeding has stopped.
With wounds of the neck, such as those caused in an attempt to cut the throat, some of the jugular veins are often divided. It is quite probable in such a case that death will occur before anything can be done. If not, jam the fingers on the bleeding point at once and replace them with a compress at your leisure. This compress should be bandaged tightly in place.

Varicose Veins are veins which have become very large from weakening of their walls. Only those of the legs need be considered here. They may burst from injury or without an injury, causing serious or even fatal hemorrhage if they are not given prompt attention.
Send for a doctor at once.
Put patient on his back.
Remove all bands around leg above bleeding point.
Raise leg.
Cut and rip clothing so as to get at bleeding point. Turn back clothing from wound.
Place surgically clean or antiseptic compress on bleeding point and bandage firmly in position, or when absolutely necessary use fingers first for direct pressure on the bleeding point and replace them by a clean compress. Keep patient lying down for some hours with the leg elevated.
If there has been considerable loss of blood, cover patient warmly and place hot bottles around him. Give stimulants

only when absolutely necessary to prevent death, as they will increase the force of the heart and so the bleeding.

## Internal Hemorrhage.

May result either from a deep wound which cuts a large blood-vessel of one of the internal organs or from the bursting of a blood-vessel of the lungs or stomach.

**Symptoms.**

Those of hemorrhage, but as the bleeding is internal it will not be seen.

**Treatment.**

Send for a doctor at once.

Put patient in a lying-down position immediately, with his head lower than his body.

Apply ice or cloths wrung out in very cold water to the point from which you think the bleeding comes. To distinguish between bleeding from the lungs and stomach, remember that from the former the blood is bright red and frothy and is coughed up, while from the latter it is dark and is vomited.

Give stimulants only when patient is becoming very weak.

## Nose-bleed.

Usually this does not result from a wound, but comes on spontaneously. Slight nose-bleed does not require treatment, as no harm will result from it.

**Treatment.—Severe.**

Place patient in a chair with his head hanging backward.

Loosen collar and anything tight around the neck.

Apply cold to the back of the neck by means of a key or of a cloth wrung out in cold water.

Put a roll of paper under the upper lip between it and the gum.

If bleeding does not cease, salt and water, a teaspoonful of salt or vinegar to a cupful of water, should be snuffed up the nose.

If bleeding still continues, send for a doctor to come at once.

Before his arrival place a small piece of cotton or gauze in the nostril from which the blood comes and shove it in gently for about 1 inch. A pencil answers very well to push this plug in.

Pinching the soft part of the nose below the bone will also help to stop bleeding.

Stimulants should be used only as in the other classes of hemorrhage.

## Abdominal Wounds.

All wounds should be treated on the general principles already described. A word or two is required, however, on the subject of Abdominal Wounds in which more or less of the abdominal contents escape through a large cut.

Send for a doctor at once.

Place a clean cloth over the wound and keep it constantly wet with a weak solution of salt and water, for if these delicate structures become dry they will suffer almost fatal damage from this cause alone.

Treat shock.

## Wounds in Which Foreign Bodies Remain.

**Treatment.**

Such bodies should be gently pulled from the wound in a direction contrary to that in which they entered.

If they are of considerable size and have damaged the tissues

a good deal, the wound should be shown to a doctor at the earliest opportunity.

With a splinter of wood, the commonest of such foreign bodies: Pull the splinter from the wound with a pair of pincers or by putting a knife blade against it and holding it on the blade with the thumb-nail.

The same method may be used with a splinter under the nail. But if it is broken under the nail, scrape the nail thin over it and cut out a small V-shaped piece so as to reach it.

Small splinters in the skin may be removed by a needle.

In order to avoid possible infection it will be much safer to wash the skin with hot water and soap and to pass the needle through a flame before using it.

A wound from which a foreign body has been removed should never be sealed with plaster or collodion.

## Eye Wounds.

As previously stated, the eyeball is fairly well protected from injury, but such injuries do occasionally occur. The symptoms are severe pain and redness of the eye, and if a wound has been inflicted it is usually easy to see the cut. Such injuries should be treated by a doctor. Therefore, in any injury of the eyeball, cover both eyes with absorbent cotton or soft cloths soaked in cool water so as to keep the eyelids still, and bandage them into place with bandages around the head. Be careful not to put on these bandages so tightly that they will press on the eyeballs, and in order to prevent inflammation keep them constantly wet with cool water until the services of a doctor can be procured. While boiled water is safer for this purpose there is little danger in the use of any clean water.

Splinters in the eye should be pulled out if possible. If they cannot be removed, put a few drops of olive or castor oil in the eye.

Whether removed or not, the eyes should be treated in the manner just described and a doctor should be consulted as soon as possible.

Foreign bodies in the eye are usually cinders, sand or particles of dust. They cause a great deal of discomfort and pain, and tears, which, fortunately, often wash them out.

Never rub the eye, as this will be likely to rub the foreign body into its delicate covering.

First, close the eye so that the tears will accumulate and the foreign body will frequently be washed out or into view, so that it may be easily removed. If this fails, pull the upper lid over the lower two or three times, close the nostril on the opposite side with the finger and have the patient blow his nose hard.

If the foreign body still remains in the eye, examine first under the lower, then under the upper lid. For the former, have the patient look up, press the lower lid down and if the foreign body is seen brush it off with the corner of a clean handkerchief. The upper lid is not so easy to see. Seat patient in a chair with his head bent backward. Stand behind him and place a match across the upper lid one-half inch from its edge. Turn the upper lid up and back over the match and brush off the foreign body as before. A few drops of castor oil in the eye after removing a foreign body will soothe it.

Lime in the eye may be neutralized by bathing it with a solution of vinegar, a teaspoonful to a cupful of water. Particles of lime large enough to be seen should be removed like other foreign bodies.

## QUESTIONS.

1. What is a wound?
2. What is the special danger to be feared in a wound?
3. What are the vital agencies?
4. What is the difference in the effect produced by a mechanical or chemical, and a vital agency?
5. How can a germ enter the body?

6. Where are the germs found?
7. What does disinfection mean?
8. What happens in a wound if germs gain entrance to it? If they do not gain entrance to it?
9. How does free bleeding diminish the danger of wound infection?
10. What is inflammation?
11. What is blood poisoning?
12. How would you prevent pus germs entering a wound?
13. What does the word "symptoms" mean?
14. What are the symptoms of inflammation in a wound?
15. When do they come on and what should you do if they appear?
16. What are the varieties of wounds?
17. What are the symptoms of wounds?
18. What are symptoms of hemorrhage?
19. How would you treat a wound without severe hemorrhage?
20. Why should one try to make a trivial wound bleed?
21. Treatment of wounds with severe hemorrhage?
22. How would you know whether bleeding comes from an artery, a vein, or from capillaries?
23. How would you treat arterial hemorrhage; venous hemorrhage; capillary hemorrhage?
24. What are varicose veins and how would you treat bleeding from them?
25. What is internal hemorrhage; how would you treat it?
26. How would you treat nose bleed?
27. Treatment of abdominal wounds?
28. Treatment of wound in which a splinter remains?
29. Treatment of a wound of the eye? How would you remove a foreign body from the eye?

## PRACTICAL EXERCISES.

The pupils should be required to treat all the dislocations and fractures described in the preceding chapter.

Have each member of the class show where he would make pressure in bleeding from the different arteries.

## CHAPTER VI.

## INJURIES FROM THE LOCAL EFFECTS OF HEAT, COLD, AND ELECTRICITY.

### Burns and Scalds, Including Burns from Electricity. Frost-bite.

### BURNS AND SCALDS.

**Description.**

Burns result from exposure of the body to dry heat, such as a fire, while scalds are produced by moist heat in the form of hot water, steam, etc. With either, the injury may be confined to the skin alone or it may extend deeper. With burns all the tissues of the body may be charred down to the bone and with scalds all the tissues may be actually cooked. With either the danger will depend upon the depth, extent and part injured as well as on the age of the injured person. Both burns and scalds of the throat and wind-pipe are especially dangerous, as the swelling of the injured part is likely to result in suffocation.

**Cause.**

Burns: Flames or fires, hot or molten metal, electric shock and explosions of gas or gunpowder.

Scalds: Steam, boiling water or hot oil.

**Prevention.**

The prevention of ordinary burns and scalds is rather a complicated subject, as it involves: (1) Prevention of fires.

(2) Putting out fires. (3) Rescue of persons at fires. (4) Extinguishing burning clothing. (5) Avoidance of danger from hot or molten metal; and (6) Methods to prevent explosions of gas and gunpowder.

## Prevention of Fires.

Many fires result from carelessness. The general principles governing their prevention comprise care in making sure to extinguish all burning objects before they are left where they may ignite other objects and in never putting lamps or the like where they may later set fire to something which is inflammable.

## Putting Out Fires.

A fire almost anywhere may be easily put out when it starts, whereas a very few moments' delay may result in so big a fire that nothing can be done to subdue it until it has burned everything inflammable within reach. It is clear, therefore, that everyone should act promptly in case of fire.

At first a fire may be smothered by a few buckets of water or by throwing blankets or woolen clothing upon it. Sand, ashes or dirt will all quickly smother a fire. One of these should always be used instead of water on burning oil, as water will spread the oil and the fire. Anything hanging should, when possible, be pulled down before attempting to smother the fire in it. A bucket brigade will often prove valuable in putting out a fire. This should consist of two lines of men from the nearest water supply to the fire. The men in one line pass buckets, pitchers or anything else that will hold water from one to another till the last man throws the water on the fire. He returns the buckets to the water supply by the other line. Remember that a draft will fan a fire and therefore keep everything closed as much as possible to prevent drafts.

### Rescue of Persons at Fires.

While searching through a burning place it will be best to tie a wet handkerchief or cloth over the nose and mouth. Remember that the air within six inches of the floor is free from smoke, so when unable to breathe crawl along the floor with the head low, dragging anyone you have rescued behind you. Crawl backward in the same way down a staircase or any slope.

### Extinguishing Burning Clothing.

If your own clothing catches on fire when you are alone, do not run for help as this will fan the flames and make them burn fiercer.

Lie down on the floor and roll up as tightly as possible in a rug, shawl, overcoat, blanket or other woolen cloth, leaving only the head out. If nothing can be obtained in which to wrap up, lie down and roll over slowly, at the same time beat out the fire with the hands. If another person's clothing catches fire, throw him to the ground and smother the fire with a coat, blanket, rug or the like.

### Avoidance of Danger from Hot or Molten Metal.

Naturally, only persons working about them are subject to burns from these sources. Common care and watchfulness will do much to prevent them.

### Methods to Prevent Explosions of Gas and Gunpowder.

The mixture of illuminating gas and air in certain proportions is a very explosive one. This is also true of the mixture of certain other gases with air. Any unprotected light will cause an explosion.

In handling gunpowder it will be best to have no matches in the pockets, and cigars, cigarettes, pipes and lights of every description are, of course, extremely dangerous.

**Symptoms of Burns and Scalds.**

Severe burning pain.

Depending on depth of injury: Reddening of skin; formation of blisters, or destruction of the skin and some of the tissues beneath it.

Shock.

**Treatment.**

When the skin is simply reddened:

Exclude air by a thin paste made with water and bicarbonate of soda (baking, not washing soda), starch or flour. Ordinary vaselin or carbolized vaselin, olive or castor oil, and fresh lard or cream are all good. One of the substances mentioned should be smeared over the burned part and on a cloth used to cover it. A light bandage should be put on to hold this dressing in place.

The services of a doctor will hardly be required for such injuries.

When blisters have formed:

Treatment may be the same, but if the blistering is very extensive it will be best to show this injury to a doctor.

Destruction of the skin and some of the tissues beneath it:

Deep burns require prompt attention from a physician. Pending his arrival they may be treated by the application of the dressing which has been described or like an open wound. A specially valuable dressing material for such burns, or in fact for all burns, is picric acid gauze which is applied in the form of a compress which should be bandaged in place like any other compress.

Treat shock.

Besides the burns which have been described, burns are frequently caused by strong acid and alkalies.

The symptoms of burns by acids and alkalies are the same as of burns caused by heat.

**Treatment.**

With either, wash off as quickly as possible; best under a water tap.

Acids: While washing injury, have lime-water procured or make a mixture of baking soda and water or get soapsuds and apply freely. If acid has entered the eye, wash it as quickly as possible with water and then with lime-water.

Alkalies: Wash in same way as with acid burns. Neutralize with vinegar, lemon juice or hard cider. Lime burns of the eye should be washed out with a weak solution of vinegar and water or with olive oil.

With both acid and alkali burns, after neutralizing, treat like other burns.

In severe burns of this character always see a doctor, and when either acid or alkali has entered the eye secure the services of a doctor as soon as possible.

Treat shock.

## ELECTRIC BURNS.

The subject of electric shock is treated at length under the proper heading ( page 104). Here, however, it is necessary to call attention to the fact that the local effect produced by contact with an electric current is a burn. This burn may be superficial or deep, depending on the strength of the current and the duration of contact. Frequently such burns are deep. Treatment of electrical burns should be exactly the same as for other burns.

**Warning.**

In all burns, whatever the cause, use care in removing the clothing. When the clothing sticks to a burn, do not drag it off, cut around the part that sticks and soak it off later with oil.

## FROST-BITE.

This is due to the local effect of cold on the body, parts of which freeze much as do certain other objects. The parts of the body which are most liable to frost-bite are the nose, ears, toes and fingers.

**Cause.**

Cold; insufficient clothing; general weakness with poor circulation of blood.

**Prevention.**

Protection of the body, especially the exposed parts named above with sufficient covering when it is necessary to expose yourself to intense cold.

Rubbing of any part of the body which becomes very cold in order to increase circulation.

**Symptoms.**

In intense cold, frost-bite not infrequently occurs without one's knowing it, but usually the ears, fingers, etc., become painfully cold and then one suddenly realizes that they no longer have feeling.

The color of the frozen part is white or grayish-white.

**Treatment.**

Object: To gradually bring the frozen part to its natural temperature.

Rub with snow or cold water. Then use warmer water gradually.

**Warning.**

The use of heat at once may result in mortification or death of the frozen part.

## QUESTIONS.

1. What is a burn?
2. What is a scald?
3. Why are burns of the throat and wind-pipe specially dangerous?
4. What are the general principles governing the prevention of fires? Suppose a fire occurs, how would you try to put it out?
5. How would you rescue a person in case of fire?
6. How would you put out burning clothing?
7. What are the symptoms of burns and scalds?
8. Treatment: Very slight burns and scalds; where blisters have formed; very deep.
9. What is the treatment of burns from strong acids and alkalies?
10. What can you say of burns from electricity?
11. What is frost-bite? What are the symptoms of frost-bite?
12. How would you treat frost-bite?

## PRACTICAL EXERCISES.

Treatment of all classes of wounds including burns and methods of checking hemorrhage by the class.

## CHAPTER VII.

## UNCONSCIOUSNESS, PARTIAL AND COMPLETE; AND POISONING.

### UNCONSCIOUSNESS.

Unconsciousness, of course, means lack of consciousness or, in other words, one who is unconscious knows nothing of his surroundings or of what is occurring. Perhaps no condition which the first-aid student may be called upon to treat may prove more puzzling than this. Unconsciousness may result from a number of different causes, so in order to give the proper treatment one must determine first what has caused his patient to become unconscious. Always make an earnest effort to do this by taking the surroundings into account as well as by examination of the patient.

Suppose, however, that you are unable to determine the cause of unconsciousness. At least make very sure that it is due neither to a poison, to bleeding nor to sunstroke, for each of these demands immediate special treatment. Then, unless it is necessary to give the special treatment, if the patient is pale and weak have him lie down with his head low and warm and stimulate him in every possible way; on the contrary, if the face is red and pulse is bounding and very strong, while the position for the patient should also be lying down, the head should be raised. No stimulants should be given in the latter condition and cold water should be sprinkled on face and chest.

The common causes of unconsciousness are shock, electric shock, fainting, alcoholic poisoning, apoplexy and injury to the

brain, sunstroke and heat exhaustion, freezing, suffocation, opium and carbolic-acid poisoning. A number of poisons besides those mentioned cause unconsciousness.

It should be remembered that while these all may cause complete unconsciousness they do not necessarily do so. That is to say, partial as well as complete unconsciousness may be due to the same cause.

## Shock.

(See page 49.)

**Cause.**

An injury.

**Prevention.**

Of injury.

**Symptoms.**

The history and probably the presence of an injury.

The symptoms given under the heading Shock.

**Treatment.**

As given.

## Electric Shock.

The more general use of electricity is making accidents due to it more common year by year. Even now the third rail and the live wire are responsible for many injuries and deaths. In mines especially the dangers from electricity are very great.

The ordinary trolley wire carries a current of about 500 volts and incandescent and arc-light currents run from 2500 to 3000 volts. The passage of these powerful currents through the body causes dangerous shock or even death.

**Prevention.**

The third rail is always dangerous, so avoid it.

Swinging wires of any kind may somewhere in their course be in contact with live wires, so they should not be touched. Electric wires must always be carefully avoided.

**Symptoms.**

Sudden loss of consciousness when the electrical current passes through the body.

Shallow breathing and weak pulse.

If hands are in contact with a live wire, person may not be able to release them at first.

Burns of hands or other parts of the body are common. Little difficulty should be experienced in making out cause of injury.

**Treatment.**

First, rescue; second, treat patient.

**Rescue.**

In some cases it will be possible to shut off current and this should always be done if it can be done quickly. Patient in contact with wire or rail carrying an electric current will transfer current to rescuer if he puts himself in the line of passage of the current.

Therefore, he must not touch the body of a person suffering from electric shock still touching a live wire or a third rail unless his own body is thoroughly insulated. Naturally, too, he must not himself, in attempting to aid the injured person, bring any part of his own body in contact with the live wire or other apparatus carrying the electric current. Moreover, he must act very promptly for the danger to the patient is much increased the longer the electric current is permitted to pass through his body. If possible, the rescuer should insulate himself by covering his hands with a mackintosh,

rubber sheeting, several thicknesses of silk, or even of dry cloth. In addition he should, if possible, complete his insulation by standing on a dry board or a thick piece of dry paper, or even on a dry coat. Rubber gloves and shoes or boots are still safer, but they cannot usually be procured quickly. If a live wire is under a patient and the ground is dry it will be perfectly safe to stand upon it and to pull him off the wire with the bare hands. But they should touch only his clothing and this must not be wet.

A live wire lying on a patient may with safety be flipped off with a dry board or stick.

In removing the live wire from the patient, or the patient from the wire, do this with one motion as rocking him to and fro on the wire will increase shock and burn.

A live wire may be safely cut by an axe or hatchet with a dry wooden handle and the electric current may be short-circuited by dropping a crowbar or poker on the wire. These should be dropped on the side from which the current is coming and not on the further side as the latter will not short-circuit the current before it has passed through the patient's body. Drop the metal bar, do not place it on the wire or you will then be made a part of the short circuit and receive the current of electricity through your body.

**How to Treat Patient as soon as He has been Rescued.**

Many cases of electric shock from powerful currents will be hopeless from the beginning. It is impossible to tell this at first, however, and in every case, therefore, an attempt should be made to save the life of the patient by prompt treatment.

Send for a doctor.

Loosen clothing around neck, chest and abdomen. Place the patient on his back with a rolled-up coat, a small log or some other object of the same shape under the shoulders so as

to throw the chest up. Press on the left chest and upper part of the abdomen about twenty times per minute. Pressing down firmly then taking off pressure and then applying it again. This stimulates the heart as well as helps to start breathing. Pull out tongue by grasping it with a dry cloth. Have some one else hold it out. Or if alone, if possible, tie in this position with a bandage or rubber band over the tongue and under the jaw. The reason for pulling the tongue forward is because in

FIG. 39.—Artificial Respiration. First Movement. (*Buckley.*)

an unconscious person it is likely to fall back and block the windpipe. Perform Artificial Respiration. The Sylvester method is one of the best. Kneel just above patient's head, catch both his arms just below the elbows. Draw the arms outward and upward gently and steadily and hold them as far as they will go above head for about two seconds. This motion opens and expands the chest to the greatest possible extent. This is due to the fact that certain muscles are attached to

both arms and ribs and when the arms are raised these muscles raise the ribs and so enlarge the chest.

Then bring the arms down till the elbows press against the chest; a little pressure will diminish the size of the elastic chest as much as possible. Do this for about two seconds.

Continue these motions about fifteen times per minute. Keep this up till the patient begins to breathe himself.

Artificial respiration when done properly is hard work for the

FIG. 40.—Artificial Respiration. Second Movement. (*Buckley.*)

operator and he should be relieved by some one else as soon as he grows tired.

Another excellent method of artificial respiration is called the "prone pressure method." The patient lies face down. The operator kneels by his side, places his hands across the lowest ribs and swings his body forward and backward so as to allow his weight alternately to fall vertically on the wrists and to be removed; in this way hardly any muscular exertion is required. The size of the chest being diminished forces the air from the lungs. The elastic chest then springs back and the air enters the lungs. The rate is fifteen per minute.

Artificial respiration should be kept up for at least an hour.

Ammonia on a sponge or handkerchief put under, but not on the patients nose will help to revive him.

At the same time that one or two persons are performing artificial respiration, without interfering with them, others should cover the patient with a dry coat or blankets.

As soon as the patient begins to breathe himself, but not before, his limbs should be well rubbed toward the heart under the blankets. This will help to restore the circulation.

When the patient is partially restored he may have a chill and vomit. If he vomits while on his back he must be turned on his right side so that the vomited matter will not enter the windpipe.

He should afterward be put to bed well covered and surrounded with hot bottles. The windows should be opened so that he may have plenty of air.

After the danger is over the patient should be allowed to sleep quietly.

He will feel very nervous and shaken for a time and should be given absolute rest till he recovers from this condition. No food except hot beef tea should be given for several hours. Hot coffee, however, is useful as soon as the patient can swallow and retain it.

It is possible for those who have received an electric shock which does not render them unconscious to perform artificial respiration of a sort on themselves and so to recover without further treatment. This is done by raising the upper extremities and lowering them again and again while taking deep breaths.

Burns from electricity should be treated like other burns. See page 99.

**Warning.**

If the breathing stops at any time after it has once begun you must immediately start again with artificial respiration.

## Fainting.

**Cause.**

A lack of blood to the brain. Some persons often faint. Fainting is common in any form of weakness, as when recovering from a severe illness. Some people faint at the sight of blood.

**Prevention.**

A person who has not yet recovered his full strength after an illness or injury should be careful not to overdo physically. Persons who faint from trivial causes require the advice and treatment of a physician. Remember that fainting may be due to a hemorrhage, and if there is any reason to suspect that the patient is bleeding, examine him carefully and check the bleeding promptly.

**Symptoms.**

Usually occurs in overheated, crowded places.

Patient becomes paler and paler and finally sinks to the floor unconscious.

Unconsciousness is partial or complete.

Face is pale, frequently covered with cold perspiration.

Pupils are natural.

Breathing is shallow and sighing.

Pulse is weak and rapid.

No other cause for unconsciousness.

**Treatment.**

Sometimes can prevent fainting by having person who feels faint double over so that head is between knees.

If this does not prove effective at once do not continue.

Air, especially cold air, and cold water often prevent actual fainting when a person feels faint.

If patient has actually fainted, put him in lying-down position with his head lower than the rest of his body, so that brain

will receive more blood. Loosen clothing, especially around neck, for same purpose. Open windows, if necessary, and keep away crowd so that patient may get plenty of air. Sprinkle face and chest with cold water. Smelling salts or ammonia to nose. Rub limbs toward body. Do not allow patient to get up until fully recovered. May give stimulant when patient has so far recovered that he is able to swallow.

## Alcoholic Poisoning.

Alcoholic poisoning or intoxication represents the final stage in acute drunkenness; that is, the common spree.

Methods of prevention are clear without being discussed.

**Symptoms.**

Perhaps history of intoxication.

Unconsciousness, partial or complete; are frequently able to arouse patient to some extent.

Face usually flushed and bloated, but sometimes pale.

Skin cool and may be moist.

Pupils natural or large. Eyeballs red, but not insensitive to touch.

Breathing about as usual when in deep sleep.

Pulse, usually rapid and weak, but may be slow.

May be strong odor of liquor.

No paralysis.

**Warning.**

In practice insensibility from alcohol and apoplexy are more often mistaken one for the other than are any other forms of unconsciousness. The most important symptoms in which they differ are the state of the pupils, the sensitiveness of the eyeballs and paralysis. The odor of liquor on the breath is of no value, because a person with apoplexy may have been drinking.

**Treatment.**

If any doubt whether drunkenness or apoplexy, always treat for apoplexy and be particularly careful not to make patient vomit, as this will cause more bleeding into brain.

In drunkenness, if able to arouse sufficiently, give emetic—mustard and water or luke-warm water are usually easily procured.

Afterwards strong coffee or aromatic spirits of ammonia.

Hot bottles around patient.

Rub toward body to increase circulation.

Should send for doctor, as may prove dangerous.

### Apoplexy and Injury to the Brain.

Apoplexy is due to the bursting of a diseased blood-vessel in the brain. The escaping blood presses on the nerve-centres and this causes the symptoms. An injury of the brain also injures these centres, so from a first-aid stand-point the symptoms and treatment of apoplexy and brain injuries may be considered under one head. Methods for preventing apoplexy are far too complicated for discussion here and, naturally, brain injuries are prevented like other injuries.

**Symptoms.**

Apoplexy often comes on suddenly.

In brain injury, may be history and evidence of injury to head.

In brain injury there may be hemorrhages f om nose, ears, mouth and eyes.

Unconsciousness, complete.

Face: Red in apoplexy. Pale in injury.

Pupils, large and frequently unequal in size.

Eyeballs insensitive to touch.

Breathing, snoring.

Pulse: full and unusually slow.

Paralysis usually on one side of body. Test by raising arm or leg. If paralyzed, will drop absolutely helpless.

**Treatment.**

Send for doctor at once.

Rest and quiet, in a dark room if possible.

In lying-down position with head and shoulders high on pillows.

Ice or cold cloths to head. Hot bottles to limbs.

No stimulants.

## SUNSTROKE AND HEAT EXHAUSTION.

### Sunstroke.

This is a condition produced by excessive heat. It is a very dangerous one.

**Cause.**

Sometimes due to direct exposure to the rays of the hot summer sun, especially when the air is moist.

Most commonly due, however, to somewhat prolonged exposure to excessive heat while working indoors, especially if overfatigued.

Too heavy clothing is likely to help to cause sunstroke, and hats and caps which do not protect the head from the sun are dangerous.

Drinking any kind of alcoholic liquor before physical exertion with exposure to the summer sun is very apt to result in sunstroke.

**Prevention.**

Avoidance of exposure to sun in middle of day in summer.

The best possible ventilation of workrooms in summer, and avoidance of overfatigue as far as possible.

Light clothing for summer and light head-gear with space above head for ventilation.

Avoid alcohol before exposure to sun.

If one feels the first symptoms of sunstroke he can often prevent actual sunstroke by stopping work, finding a cool place, lying down, bathing face, hands and chest in cold water and drinking freely of cold water.

**Symptoms.**

Usually before actual attack, pain in the head and feeling of oppression.

Unconsciousness complete.

Face red.

Pupils dilated.

Skin very hot and dry.

No perspiration.

Breathing labored and sighing.

Pulse slow and full.

**Treatment.**

Consists in reducing temperature.

Send for doctor.

Remove at once to cool place.

Loosen and remove as much clothing as possible.

Apply cold to head and body. To do this, cold water or ice should be rubbed over face, neck, chest and in armpits. Is still better to put patient in a very cold bath or to wrap him in sheets wrung out in cold water which should be kept wet and cold with water or ice. If this is done, must rub continually to prevent shock and to bring hot blood to surface.

When consciousness returns, may be allowed to drink cold water freely.

Cold may be discontinued when consciousness returns, but if skin again becomes very hot, must renew.

No stimulants.

## Heat Exhaustion.

Though this condition is caused and prevented in the same ways as sunstroke, it is really quite different from it. Heat exhaustion is just what its name states—exhaustion or collapse due to excessive heat.

**Symptoms.**

Great depression and weakness but not really unconscious.
Face pale and covered with clammy sweat.
Breathing shallow.
Pulse weak and rapid.

**Treatment.**

Send for doctor.
Remove to cool place and have patient lie down in most comfortable position with clothing loosened.
No cold externally, but may sip cold water.
Stimulants, as tea, coffee, aromatic spirits of ammonia or small amount of brandy or whisky with a good deal of water.

## Freezing.

This condition is produced by long exposure to extreme cold.

**Cause.**

Extreme cold.
Effect of which is increased by overexertion, hunger, alcoholic liquors and insufficient clothing.

**Prevention.**

If you expect to be exposed to extreme cold, procure warm clothing sufficient in amount to protect you from its effects. Do not attempt a long journey in the cold without food and and do not make the journey so long that you are likely to have to stop and perhaps lie down on account of exhaustion.

Do not drink alcoholic liquors, for though they give a temporary sense of warmth, you will be more easily overcome by cold after this effect wears off.

If caught out without shelter in very cold weather use all your energy to keep moving. Lying down under such circumstances almost always results in freezing.

**Symptoms.**

Circumstances should be taken into account. Depression is so great that appearance of patient is like that of a dead man.

**Treatment.**

Object is gradually to restore warmth to the body.

Take patient into a cold room, rub limbs toward body with rough cloths wet in cool water, increase temperature of room if possible. This should be done gradually and cloths should be wet in warmer and warmer water. As soon as patient can swallow, give stimulant—coffee or tea in small quantities, frequently repeated with the addition of a little whisky, brandy, or aromatic spirits of ammonia.

Patient should not be placed before an open fire or in a hot bath until circulation has become active in cool room. You will know this by an increased force of the pulse, better breathing and more warmth and color in the skin.

## Suffocation.

(Especially Gas Poisoning.)

Suffocation may be caused either by something which blocks the windpipe and so prevents air from entering the lungs or by the inhaling of some fluid or gas other than air which by its presence prevents the air from entering the lungs. Moreover, such a gas is usually poisonous in itself. Hanging and choking are examples of the former condition and drowning and gas and smoke poisoning

of the latter. Every first-aid student should know how to treat a person who has been choked or nearly drowned. The treatment is essentially artificial respiration. In drowning, before artificial respiration is performed, mud and water should be cleaned from the mouth with a handkerchief on the finger and in order to drain the water from the throat and lungs the patient should be turned on his face, the hands should be clasped around his waist; he should be raised up by the middle and kept elevated for a few seconds.

The various forms of poisoning by gas are of great importance and especially so to miners and workmen in sewers and wells, nor are leaky gas fixtures in dwellings particularly uncommon.

**Causes.**

A gas which produces suffocation and is also poisonous in itself: The common gases of this character are sewer gas, coal gas from furnaces or stoves, illuminating gas and smoke. The deadly back draft is caused by a fire in which the place becomes packed with smoke which contains many combustible matters which a draft of air causes to explode.

**Prevention.**

Naturally is dependent on the cause. Extraordinary care must be taken wherever much gas is present.

In sewers and wells it is customary to lower a lighted candle or torch; if this does not burn it is certain that the air is so impure it will not support life.

Leaks in gas pipes should be promptly repaired. Be careful in turning off gas to make sure that gas is actually shut off.

It is dangerous to leave a gas jet burning faintly when you go to sleep, as it may go out if pressure in gas main becomes less, and if pressure is afterward increased, gas may escape into room in large amount.

Coal gas will escape through red-hot cast iron, and very big fires in such stoves are dangerous, especially in sleeping rooms.

Charcoal burned in open vessels in tight rooms is especially dangerous.

**Symptoms.**

History of the presence of a gas or of escaping gas. First: headache, dizziness, throbbing of head, ringing in ears, spots before eyes, then gradually unconsciousness. Face and lips bluish.

Tongue blue, may be swollen and protruding between the teeth.

Skin pale or bluish. Nails blue.

Pulse weak and rapid.

Breathing intermittent.

With back draft, also severe burns

**Treatment.**

Send some one else for a doctor at once.

Rescue patient promptly and bring him to place where there is plenty of good air. To rescue an unconscious person in a place filled with gas, move quickly and carry him out without breathing yourself. Take a few deep breaths before entering and if possible hold breath while in the place. Frequently less gas will be found near floor. So, one may be able to crawl where it would be dangerous to walk.

Loosen clothing about chest and abdomen.

Perform artificial respiration, sprinkle cold water on face and chest, give stimulants as soon as patient recovers sufficiently to swallow.

## Poisoning by Opium or by Some Mixture Containing Opium.

**Symptoms.**

May get history of having taken opium or may find bottle which contained poison.

Unconsciousness which comes on gradually and finally becomes complete.

Face red at first, finally dark purple. Lips bluish.

Pupils very small, like pin heads.

Breathing full and slow at first, gradually slower and shallow.

Pulse, slow and full, afterwards weak.

Possibly smell of laudanum on breath.

Symptoms that should be especially noted are pin-head pupils, character of breathing and patient is first very sleepy and then becomes unconscious.

**Treatment.**

Give an emetic; mustard and water; salt and water; luke-warm water alone in large quantities. Exact dose is unimportant, give in large quantities and repeat if profuse vomiting does not occur. (May have difficulty in getting emetic to work). Plenty of strong coffee. Try to arouse patient by speaking loudly and threatening him, but do not exhaust his strength by compelling him to walk. Artificial respiration and stimulants.

## Carbolic Acid Poisoning.

**Symptoms.**

History of poison or presence of bottle which contained poison.

Vomiting and great pain.

Skin covered with cold sweat.

If severe case, unconsciousness, usually followed promptly by death.

May almost always know by the strong smell of carbolic acid.

Lips, tongue and mouth are burned white by pure, and black, by impure carbolic acid.

**Treatment.**

Rinse mouth with pure alcohol. If grown person, should swallow 3 or 4 tablespoonfuls of alcohol mixed with an equal quantity of water. Follow this in five minutes with 2 tablespoonfuls of Epsom salts dissolved in a little water. Though not so good, lime-water may be used to rinse mouth, several glasses of it being also swallowed. Three or four raw eggs may be given or castor or sweet oil. Stimulants always, and keep warm.

## POISONS.

Any substance taken into the body which will cause death is a poison. But only poisons which are swallowed will be considered here.

**Prevention.**

Accidental poisoning may be prevented to a very great extent by never taking any medicine which is not properly labeled, and by putting poisons, when they must be kept on hand, in a safe place under lock and key.

**Symptoms and Evidences of Poisoning.**

The symptoms vary somewhat with the special poison. But there are certain evidences which indicate, in the majority of cases, that a poison has been taken.

Sudden and severe sickness in a person who has been in good health, after eating, drinking or taking medicine.

Possibly the patient has been melancholy or has talked of suicide.

The presence near the patient of bottles, glasses or the like in which some of the poison remains.

Frequently a person who has taken poison intentionally becomes frightened and is only too glad to tell some one that he has poisoned himself and what poison he has used.

In accidental poisoning the patient is, of course, willing to tell all he knows in reference to the poison.

If a number of persons who have eaten the same food become seriously ill after a meal, it is almost certain they are suffering from poison, probably decayed food or the so-called ptomaine poisoning.

**Treatment.**

This has been discussed at some length on pages 111 and 119 for alcohol, opium and carbolic acid.

The general practice in the treatment of other poisons should be to give an emetic.

Send for a doctor at once and, if possible, have messenger tell him what poison has been taken so that he may bring the proper antidote.

Do not wait for doctor to arrive, but give an emetic to rid body of poison.

Good emetics are: Mustard and water, salt and water, lukewarm water alone in large quantities, ipecac. The doses of each are given under the heading Emetics. Do not waste time in getting the exact dose, however, and repeat if profuse vomiting does not result.

## QUESTIONS.

1. What does the word unconsciousness mean?

2. Suppose you found an unconscious person and you did not know what caused him to become unconscious, how would you treat him?

3. What are the common causes of unconsciousness?

4. How weak a current will cause dangerous electric shock?
5. Electric shock; prevention; symptoms?
6. What would you do to rescue a person in contact with a live wire?
7. How would you treat him after he had been rescued?
8. How would you treat a burn due to electricity?
9. Fainting: cause; prevention; symptoms and treatment?
10. Alcoholic poisoning: With what is this often confused and what would you do in order to prevent your making such a mistake?
11. Treatment of alcoholic poisoning?
12. Apoplexy and injury to the brain; symptoms and treatment?
13. Sunstroke; cause; prevention; treatment?
14. What is the difference between sunstroke and heat exhaustion?
15. Treatment of heat exhaustion?
16. Symptoms and treatment of freezing?
17. What is suffocation due to?
18. How would you treat a person who was apparently drowned?
19. What is back draft?
20. To what may gas poisoning be due?
21. Treatment of gas poisoning?
22. Treatment, suffocation from back draft?
23. What are the symptoms and treatment of opium poisoning?
24. Symptoms and treatment of carbolic acid poisoning?
25. Suppose you came across an unconscious person, what would make you think he had been poisoned?
26. What would be your treatment for a poison of which you did not know the exact character?

## PRACTICAL EXERCISES.

Artificial respiration.

## CHAPTER VIII.

## HOW TO CARRY INJURED.

A man trained in first aid will usually find when he has treated an injury that his duty is but half performed. Accidents usually occur in places from which it is absolutely necessary to carry patients, and unless the proper means for transporting them are understood and practiced very grave harm may result to them. In fact, the benefits from good first-aid treatment may be undone by bad transportation.

It should be understood, of course, that whatever method of transportation is adopted, first aid should be given before it is attempted, and that when necessary the clothing should be loosened so that it will not constrict the neck, chest nor abdomen during transportation.

The kind of transportation which should be furnished must, of course, vary widely with the character of the complaint. All serious cases of illness or injury should be carried on stretchers whenever it is possible to procure or to improvise them and in case of doubt it is always much safer when practicable to carry the patient lying down.

### STRETCHER TRANSPORT.

The ordinary type of stretcher is so well known that it hardly need be described. It consists of two long poles with a bed usually made of canvas between them and cross-pieces to keep the long poles apart and thus to stretch the canvas. The poles are long

enough to afford handholds for the bearers at each end of the stretcher. Fairly satisfactory stretchers may be improvised. The easiest one of these to make usually is the coat stretcher. For this two coats and a pair of poles are needed. The sleeves of the coats are first turned inside out and the coats are then placed on the ground with their lower edges touching each other, the poles are passed through the sleeves on each side, the coats are buttoned up

FIG. 41.—Coat stretcher.

and the buttoned side turned down. Two poles and a large blanket or rug may also be used to make a stretcher. The blanket or rug is spread on the ground with the two poles at the edges of its long sides. These edges are then rolled on the poles till a distance of about 20 inches is left between them. This stretcher may be turned over before being used, and especially with narrow blankets or rugs it is much safer to bind them to the poles with twine. With both these stretchers it is desirable, when possible,

to tie on two pieces of wood for cross-pieces so as to prevent the poles from approaching each other when the weight of the patient is put on the stretcher.

Instead of rugs and blankets, bags and sacks may be employed for stretcher beds. The bottoms of the latter should be ripped so that the poles may be passed through the number sufficient to give the length of stretcher required. With these and similar stretchers careful tests should be made before allowing them to be used for patients; care is also necessary to guard against accidents during transportation.

Numbers of articles, some of which may almost always be easily procured, may also be used for stretchers in case of necessity. Such articles are doors, window shutters, boards, bed frames, benches, ladders, mattresses, rugs, blankets and mats.

Whatever the type of stretcher used, the greatest gentleness should be observed in transferring the patient to it, and unless he is to be subjected to unnecessary suffering all his bearers must work in unison. The necessity for bearers working together has been so thoroughly appreciated by all the armies of the world that they all now give a regular stretcher drill to men charged with the duty of carrying wounded.

It is not absolutely necessary for every student of first aid to learn a drill but it is very desirable, as men knowing the drill can always work together better and without any confusion, to the great benefit of the patient.

The drill given here is modified from that of the United States Army.

## STRETCHER DRILL.

### Each Stretcher Squad Consists of Four Men.

1. **Fall In.**—The four men form in line and count off beginning at the right. No. 1 commands the squad and issues the orders.

In his absence No. 4 takes command; if Nos. 1 and 4 are both absent the duty falls on No. 3.

2. **Procure Stretcher. March.**—No. 3 steps one pace to the front and, facing in the direction of the stretcher, proceeds thither by the shortest route, takes the stretcher and places it on his right shoulder. He then returns to his place in line.

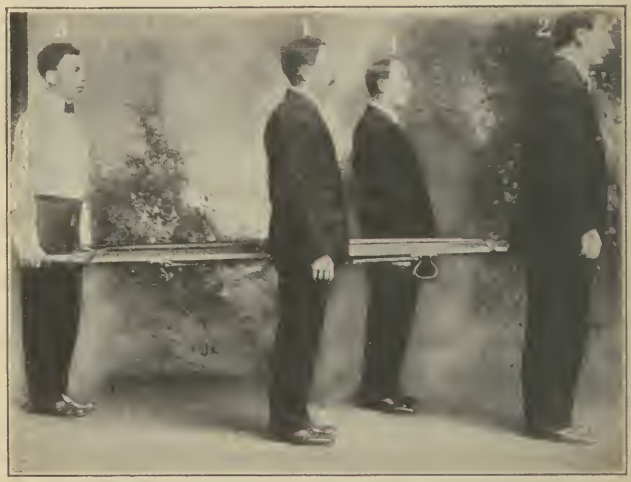


FIG. 42.—Carry stretcher.

3. **Carry Stretcher.**—No. 3 drops the upper handles forward with canvas to the left; No. 2 steps forward and catches the front handles with his left hand; Nos. 1 and 4 advance to the middle of the stretcher, to the right and left, respectively; Nos. 2 and 3 hold the stretcher between the hand and the hip, grasping the lower handles.

4. **Open Stretcher.**—Nos. 2 and 3 open the stretcher and arrange the braces. All the bearers take the position shown in Fig. 44, but with stretcher lowered to the ground.

5. **Close Stretcher.**—The movements are reversed and the position of "Carry Stretcher." is taken.


FIG. 43.—Patient lifted.

6. **Take Posts To Load Stretcher; March.**—Nos. 1 and 4 run ahead and take positions at the patient's right and left sides, respectively, examine the patient and give him first-aid treatment; Nos. 2 and 3 follow with the stretcher.

7. **Lower Stretcher.**—Nos. 2 and 3 lower the stretcher one yard from the patient's head and in line with his body. This command is given by No. 3. If the stretcher is not open before

giving the command "Lower Stretcher" No. 3 commands "Open Stretcher."

8. **At Patient's Right (or Left) Posts.**—Nos. 2 and 3 take posts at patient's right (or left) ankles and shoulders. They then assist Nos. 1 and 4 in first-aid work. When the patient is ready for the stretcher the next command given is:


FIG. 44.—Stretcher lifted.

9. **Prepare to Lift.**—All bearers kneel on the knee nearest the patient's feet, right for his right and left for his left; No. 2 passing both his arms under the patient's legs; Nos. 1 and 4 passing their arms under his loins and thighs; No. 3 passing one arm under his shoulders and the other under his neck to the further shoulder, thus supporting the head. In case of a fracture, the bearer nearest to it supports the part and looks after it.

10. **Lift Patient.**—All lift collectively and raise the patient slowly and gently to the knees of the three bearers who are in line; then the odd bearer, No. 1 or 4, arises and passing by the shortest route to the stretcher, grasps it by the middle, one pole in each hand, and places it in front of the bearers and against their ankles.

11. **Lower Patient.**—No. 1 or 4 stoops and assists the other bearers to lower the patient gently to the stretcher and then all resume their respective posts.

12. **Prepare to Lift; Lift.**—At Prepare to Lift, Nos. 2 and 3 stoop, place the slings over their shoulders—if the stretcher has slings—grasp the handles and at the word **lift** they rise and stand erect.

13. **March.**—With the lifted stretcher the bearers march with a short, sliding step of about 20 inches; Nos. 1, 2 and 4 step off with the left foot and No. 3 with his right, forming a "break step." The patient is carried head first.

14. **Halt; Lower Stretcher.**—Nos. 2 and 3 lower the stretcher gently to the ground. When lowering or lifting a stretcher, the rear bearer must always watch the front bearer and move simultaneously with him.

## Unloading the Stretcher.

15. **Prepare to Lift.**—The bearers, standing at their respective posts, kneel and adjust their hands as in lifting to load the stretcher.

16. **Lift Patient.**—The bearers lift the patient to their knees and No. 1 removes the stretcher.

17. **Lower Patient.**—Nos. 2, 3 and 4 lower him to the ground, or, if he is to be put on a bed, or an ambulance bed, they rise from their knees and side-step to the bed, the stretcher having been placed one yard away and in line with the bed.

When there are only three bearers, the patient is lifted or lowered

to the knees of two, while the third places or removes the stretcher; or he may be carried on a two-handed seat, his legs being supported by the third bearer.

### Position of Patient on the Stretcher.

The position of a patient on the stretcher depends on the character of his injury. An overcoat, blanket, or other suitable and convenient article should be used as a pillow to give support and slightly raised position to the head. If the patient is faint the head should be kept low. Difficulty of breathing in wounds of the chest is relieved by a sufficient padding underneath. In wounds of the abdomen the best position is on the injured side, or on the back if the front of the abdomen is injured, the legs in either case being drawn up, and a pillow or other available object being placed under the knees to keep them bent.

In an injury of the upper extremity calling for stretcher transportation, the best position is on the back with the injured arm laid over the body or suitably placed by its side, or on the uninjured side with the wounded arm laid over the body. In injuries of the lower extremity the patient should be on the back, or inclining toward the wounded side; in cases of fracture of either lower extremity, if a splint cannot be applied, it is always well to bind both limbs together.

### To Cross an Obstacle Such as a Wall.

Lower the stretcher about three feet back from the obstacle. Nos. 3 and 4 grasp the stretcher poles at the end, one on each side; No. 2 climbs over the obstacle and receives the stretcher as it is passed over to him; Nos. 1 and 4 then climb over and again taking the stretcher poles pass it entirely over the obstacle; No. 3,

who has been holding the head of the stretcher at this time, now climbs over, they all resume their former positions and proceed.

Transportation along narrow passages or a ditch is effected by Nos. 1 and 4 bestriding the stretcher in a narrow place or descending into the ditch to support the stretcher. If the ditch be


FIG. 45.—Crossing an obstacle.

deep and wide, the stretcher must be halted and lowered with the handles near the edge; then Nos. 1 and 4 descend and proceed as before.

## To Load an Ambulance or Wagon.

Carry the stretcher, with the patient's head foremost, to within one yard of the rear of the ambulance and lower the stretcher to

the ground; Nos. 1 and 3 take positions at the patient's right and left shoulders, respectively. At the command **prepare to load** No. 2 faces about and stooping, grasps his handles, and Nos. 1 and 3 the poles on their respective sides. No. 4 opens the doors and sees that everything is in proper condition.

At the command **load,** the bearers lift the stretcher to the height of the ambulance floor and advance, keeping the stretcher level. The legs of the stretcher are placed on the ambulance floor by Nos. 1 and 3, the stretcher is pushed in by No. 2 assisted by the others.

Whenever it is possible all the bearers should accompany the ambulance, Nos. 1 and 3 occupying the seats inside, No. 2 inside at the patient's head, and No. 4 standing on the footboard outside.

### To Unload an Ambulance or Wagon.

At the command **prepare to unload,** No. 4 opens the doors if necessary, No. 2 grasps the handles of the stretcher and at the command **unload,** draws out the stretcher, assisted by Nos. 1 and 3 who, facing inward, support the poles until the inner handles are reached. The stretcher must be kept level and lowered about a a yard from the vehicle. Then No. 4 closes the doors and all take their posts at the stretcher.

## GENERAL DIRECTIONS.

In moving the patient either with or without the stretcher, every movement should be made deliberately and as gently as possible, taking special care not to jar the injured part. The command **steady** will be used to prevent undue haste or other irregular movements.

*The loaded stretcher should never be lifted or lowered without orders.*

Should your patient have a broken bone be particularly careful that he is not jolted. A little intelligent care will prevent this.

Never carry a stretcher on your shoulders.

Always carry a patient feet foremost except when going uphill. But in cases of fracture of the leg or thigh if he has to be taken down a steep hill carry him head foremost, keeping him as nearly level as possible.

Wherever obstacles are in your path go around them, for every time a patient is set down or lifted it gives him additional pain.

Only when the crossing of obstacles is unavoidable, as where a fence cannot be torn down, a breach cannot be made in a brick wall or cars cannot be gotten out of the way should they be crossed as provided on page 130.

Accompanying all accidents there is a certain amount of shock, which induces a sensation of cold, so that even at midsummer injured men sometimes shiver with cold. Therefore, it is important that the patient be well covered with blankets or whatever clothing may be handy, whether the season be summer or winter.

All commands should be given in a low tone, but distinct enough to be heard by all the bearers.

It should be the duty of the bearers to keep at a respectful distance the morbidly curious people who are always attracted by accidents, who ask questions, shut out fresh air and do many other things detrimental to the patient.

Time being an essential factor in accidents, the patient should be borne to his home or a hospital without unnecessary delay. With this end in view, the ambulance driver should drive as fast as the condition of the road and comfort of the patient will permit, exercising special care and driving slower where the road is bad.

It is also important that a physician be notified as early as possible, and equally as important that at the same time he be

informed of the nature of the accident. Due attention to this matter may prevent fatal results.

When wagons or other vehicles must be used in place of an ambulance always, if possible, put plenty of straw, leaves, or boughs on the floor so as to reduce the jolting.

## TRANSPORTATION WITHOUT A STRETCHER.

Not infrequently in accidents it will not be possible to procure a stretcher for the patient. The first-aid student should therefore learn good methods of procedure under such circumstances as lack of knowledge in this particular will subject the patient to risk of further injury and to a great deal of unnecessary pain.

### With Two Bearers.

If the injured person be unable to walk, has not lost consciousness, and can use his arms, a good plan to adopt is the four-handed seat or "lady's chair" of children. To form it two men grasp each his left wrist with his right hand, and with his left hand grasps his fellow's wrist. Seated on this, the patient throws his arms over the shoulders of the bearers.

A two-handed seat is more comfortable, both for the patient and the bearers. The right-hand bearer grasps with his right hand the left wrist, and with his left hand the right shoulder of his fellow-bearer; the left-hand bearer grasps with his left hand the right wrist of his fellow, and with his right hand the left shoulder. (See Fig. 46.)

Still another method which requires no effort on the part of the patient, but is not applicable to severe injuries of the limbs, is called carrying by the extremities. For this one bearer takes position between the patient's legs and the other at his head, both facing toward his feet.

FIG. 46.—Two-handed seat.

FIG. 47.—Assisting to walk.

The rear bearer raises the patient to a sitting position, clasps him from behind around the body under the arms, while the front bearer, standing between the legs, passes his hands from the outside under the flexed knees. Both rise together.

### With One Bearer.

There are four methods for this:

1. The bearer merely assists the patient to walk.
2. The patient is carried in the bearer's arms.
3. The patient is carried across the bearer's back.
4. The patient is carried astride the bearer's back.

### No. 1, Assisting to Walk.

The patient is probably suffering from a comparatively slight injury of the upper part of the body, his legs uninjured. Stand by his side; put his sound arm over your shoulder and behind your neck; grasp his hand with your own and pass your other arm around his waist to support him. A single bearer may thus, if necessary, assist two slightly injured persons. (See Fig. 47.)

### No. 2, Carrying in Arms.

The patient is lying on the ground probably insensible, and totally helpless.

The bearer, turning patient on his face, steps astride his body, facing toward the patient's head, and with hands under his armpits lifts him to his knees; then clasping hands over abdomen, lifts him to his feet; he then with his left hand seizes the patient by the left wrist and draws left arm around his (the bearer's) neck and holds it against his left chest, the patient's left side resting against his body, and supports him with his right arm about the waist. (Fig. 47.)

FIG. 48.—Carrying in arms.

From this position the bearer with his right arm upon the patient's back passes his left under thighs and lifts him into position, carrying him well up. This method is very easy for the patient but hard on the bearer; therefore, it is used only when the patient is insensible and his destination not distant. (Fig. 48.)

### No. 3, Carrying Across Back.

The patient is first lifted erect as described in previous paragraph, when the bearer with his left hand seizes the right wrist of the patient and draws the arm over his head and down upon his left shoulder, then shifting himself in front, stoops and clasps the right thigh with his right arm passed between the legs, his right hand seizing the patient's right wrist; lastly the bearer with his left hand grasps the patient's left and steadies it against his side, when he rises. This method is comfortable for the patient and easy for the bearer and is particularly recommended when the patient is not insensible, but is unable to render his bearer any assistance. (Fig. 49.)

### No. 4, Carrying Astride of Back.

The patient is lifted erect (as described), when the bearer shifts himself to the front of the patient, back to the patient, stoops and grasping his thighs, brings him well upon his back.

As the patient must help himself by placing his arms around the bearer's neck, this method is impracticable with an unconscious man.

In lowering the patient from these positions the motions are reversed. Should the patient be injured in such a manner as to require these motions to be conducted from the right side instead of left, as laid down, the change is simply one of hands—the motions proceed as directed, substituting right for left and *vice versa*.

A patient astride the back of a bearer may, when necessary,

FIG. 49.—Carrying across back.

be carried up a ladder, though with considerable difficulty. A better method is sometimes used, especially in mines. This requires an apparatus which consists of a wide belt which is held just below the armpits of the bearer by suspenders over the shoulders. From the belt a wide band leads to join the belt on the opposite side. The patient sits in this band supporting himself partially by his hands on the bearer's shoulders.

## QUESTIONS.

1. When would you use a stretcher for a patient?
2. What position would you put the patient in on a stretcher? Usually; if fainting; if abdomen is injured; if leg is broken?
3. When is command steady given?
4. Is patient carried head or feet foremost?
5. What would you do to prevent shock to patient on stretcher?

## PRACTICAL EXERCISES.

(In all these exercises in which the services of more than one man are required, one man should be selected to take charge and should give the necessary directions to his assistants.)

1. Make a coat stretcher.
2. Fall In; Procure Stretcher. March; Carry Stretcher.
3. Open Stretcher; Close Stretcher.
4. Take Posts To Load Stretcher. March; Lower Stretcher; At Patient's Right. Posts; Prepare To Lift. Lift Patient; Lower Patient.
5. Prepare To Lift. Lift; March; Halt. Lower Stretcher.
6. Unload stretcher by command.
7. Cross a wall with loaded stretcher.
8. Load an ambulance.
9. Unload an ambulance.
10. Carry a patient with two bearers.
11. Assist patient to walk.
12. Carry in arms.
13. Carry across back.
14. Carry astride of back.

## CHAPTER IX.

## INDUSTRIAL ACCIDENTS.

1. Railroad Injuries. 2. Mining Injuries. 3. Injuries of Factory and Workshop. 4. Injuries from Electric Apparatus. Hernia and Rupture.

Industrial accidents are all of a somewhat similar character. Nearly all the wounds so received are crushed, ragged, mangled and torn, and almost always are associated with a fractured bone. The "break" or fracture is usually an open or compound one due to the heavy weights that fall on the leg, arm or body. The large, rough pieces of rock and coal in mines and the enormous weight of the car and car wheels going over the part almost always fills the wounds with pieces of clothing, grease, coal and rock. There is always a great amount of shock due again to the crushing weight that produces the injury. The life is often totally mashed out of the flesh or tissues. They are again more prone to infection or blood-poisoning because of the dirty grease, clothing, rock, coal and particles of metal ground right into them. Similar injuries are often caused by machinery in factories.

In railroads we have severe scalds and burns from steam and fire. In mines we see more terrible burns from gas, dust explosions, contact with electric currents, and explosions of powder and dynamite, and these burns (powder) are very frequently associated with large, gaping, and mangled wounds due to the

flying pieces of metal, rock and coal; in fact, the injuries produced by a miner being "shot" are a duplicate of the effects on a man's body of a bursting shell from a modern piece of artillery.

For accidents in these two occupations intelligent first aid is more needed and more good can be accomplished by it than in any other class of accidents, possibly excepting wounds on the battle-field. Usually railroad accidents occur at some distance from the nearest station, also a long distance from proper medical aid, and in the night. It has been stated by some one that "If railroad catastrophies could occur at a station in some large town or city in the block of a well-equipped hospital with doctors and nurses awaiting the accident, and in the daytime, there would be no need of first aid or first-aid training for railroad men." But it is the opposite that always obtains, and mining accidents occur under still worse conditions and surroundings. They occur a mile or two from the mine shaft or opening, and several hundred feet under-ground, and if the accident is caused by a fall of roof or an explosion the passage ways are blocked up by falling materials and the exit may be totally barred. Also the surroundings are by nature dirty and filthy and the means of transporting the injured are lacking and even if the way of exit is fairly clear the transportation of the injured man in necessarily slow and tedious. Usually from one to two hours elapse before the injured man can be gotten out of the mine and perhaps an equal period before he can be gotten to his home or a hospital. It can be readily seen what could happen during that time if nothing were done for him in the line of first aid. Among the things that might occur would be death from bleeding, or shock; a simple fracture made open or compound by ignorant handling or so twisted and deformed that it would be difficult to reduce.

Wounds become more infected from dust and handling and the patient may arrive at the doctor's or at a hospital in such a

weakened condition that he will die or his recovery will be doubly prolonged.

Then contrast this picture with an injured man who had fallen into the hands of trained and intelligent first-aid men—the bleeding would be stopped by the proper application of a compress or tourniquet. His wounds would be cleanly dressed, his broken leg would have a temporary splint properly applied so that no deformity could occur, his pain would be relieved; he would be covered warmly with blankets, the shock would be almost *nil*, and he would go into the doctor's or the hospital a stronger, safer, and better patient in every way.

The necessity for first-aid treatment in industries other than railways and mines is also very great.

## 1. Railroad Injuries.*

A statement in reference to deaths and injuries on railroads will be found in the introduction. The report of the Interstate Commerce Commission shows that in 1909 the number of killed in railroad accidents was reduced nearly one-half and the number injured nearly 20 per cent. and yet 2791 were killed and 63,920 injured last year.

This certainly demonstrates the necessity for a knowledge of first aid on the part of railroad men.

Causes: The causes of railway injuries are various: coupling cars frequently results in the crushing of the hands of brakemen; wrecks; falling from trains; being struck by cars, etc.

**Prevention.**

* In studying this chapter it is suggested that the teacher take up the special subject of most value to his particular class, and if necessary, that he add to what is said here to meet the exact circumstances of his class.

## Employees.

Proper instruction in the theory and practice of safety in railroading by the company.

Safety appliances provided by the company.

Common care on the part of employees.

Reasonable hours of work so that physical exhaustion does not cause indifference and carelessness: an obligation of the company.

General instruction in first aid for employees.

First-aid supplies.

## Passengers and Others.

(Suggested by one of our most prominent railroad men.)

"Never cross a railway at a grade crossing before making sure that no trains are approaching."

"Never jump on or off cars in motion."

"Never stand on platforms of cars in motion."

"Never put head or other part of person out of car window."

"Never cross in front or rear of standing or moving train without first making sure that there is no danger from some other train or cause."

"Never disobey the cautionary rules for safety posted at stations, crossings, etc."

"Never forget that carelessness on your part in regard to these precautions not only endangers your life, but the happiness and welfare of those most dear to you."

### Symptoms.

These naturally depend upon the character of the particular injury.

The commonest railway injuries are fractures, usually compound, and severe wounds, sometimes clean-cut, but more often

lacerated with not infrequently actual tearing off of fingers and toes.

Severe crushing and mangling injuries are also common and trifling wounds are a matter of every-day occurrence on every railroad.

Wounds produced by railway injuries are usually dirty, as grease and coal dust are frequently ground into them. The crushing often prevents severe hemorrhage, but, on the other hand, tissues torn apart frequently bleed freely. Shock is generally severe.

**Treatment.**

A railroad wreck probably emphasizes the value of a knowledge of first aid better than any other accident. Too often, excited people totally ignorant of what they should do, harm injured more than help them. In a railroad wreck every one who can do so should at first be employed in removing injured from the wrecked cars. This is especially true if there is danger from fire. The injured should be taken far enough from the wreck so that people about it will not stumble over them. If two men with a knowledge of first aid are present, one should post himself at the wreck so that he may instruct the helpers how to carry patients in order not to injure them further, and the other should take care of the patients at the place selected for them.

Railway injuries involve no principles of treatment which have not been taught in the preceding pages. Crushes when bones are broken demand the careful application of splints, and railway wounds of every sort should be treated just like other wounds. It should never be forgotten that shock is severe in this class of injuries and demands careful treatment.

Not infrequently in railroad injuries on arrival of the patient

at a hospital it is found that he has lost so much blood that his condition is hopeless. Remember, therefore, to check hemorrhage as far as possible, for even if it is not immediately alarming, within a comparatively short time if hemorrhage continues a dangerous amount of blood will be lost. Besides, shock at the time of injury weakens the heart, which beats more strongly again after reaction begins and then much blood may be lost from torn vessels.

It seems quite unnecessary to call attention to the fact that the services of a doctor are required promptly for such injuries. Certain emergency supplies are necessary for the treatment of railway injuries.

This need can be satisfactorily met in this country by the use of the American Red Cross First Aid Box. This box is described at the end of the book.

While the time will undoubtedly come when emergency supplies will be found on all our railway trains, or at least in an accident room at railway centers, this is not the case at present. We must, therefore, almost always rely on what we can find near at hand.

Splints may be made from the canes and umbrellas of the passengers or in a wreck from pieces of the broken cars. Pillows may also sometimes be obtained. Unused linen from a sleeping-car makes a much better covering for a wound than dirty clothing. Bandages may also be made from sheets.

For shock the patient should always be put in the lying-down position with his head low, on a mattress if one is obtainable. He should be well covered with blankets or coats. Shock, of course, demands the use of some stimulant, and an effort should be made to obtain some whisky from passengers or bystanders. Do not give whisky in large quantities, however. If a doctor may be expected to arrive soon, one large drink of

whisky should be given; but if the patient must go several hours before he can have care from a doctor, it will be better to give him a teaspoonful of whisky in a tablespoonful of water and to repeat this every ten minutes if necessary, depending on his condition.

The injured men may be carried on mattresses or coat stretchers may be used.

## 2. Mining Injuries.

The last report obtainable that of 1908 shows that 6772 non-fatal and 2450 fatal accidents occurred in the United States during the year covered by the report. It is therefore obvious from these figures alone that a knowledge of first aid is essential to the miner. Moreover, as is well known, accidents in mines generally occur at places where the injured person is absolutely dependent on a comrade for treatment. And the services of a doctor are often not obtainable for many hours, when they will probably be of but limited value if the injured man has been badly cared for in the meantime. The American Red Cross has given special attention to the needs of miners in regard to first-aid instruction and, as stated in the preface, one of the authors of this book is now constantly employed under direction of that association in organizing first-aid instruction in the mines throughout the country.

**Causes.**

Various: Falls of ore, rock, or coal; explosion of gas or powder; being struck by mine cars; or, when mules are used, kicks from them; electrical shock.

**Prevention.**

Proper instruction in safety in mining by the company. (Best done by a list of "Don't" printed in various languages and put in the hands of everyone employed about a mine.)

Safety appliances provided by the company.

Common care on the part of employed (remember carelessness on your part may not only result in your own injury, but in that of other people).

One miner, through carelessness, can endanger the lives of all the men in the mine.

It is generally believed by those best acquainted with the facts that the majority of mine accidents are due to the lack of care on the part of the miners themselves, and too often of the most intelligent and best miners. Mining at the best is an extremely hazardous occupation which for comparative safety requires that the best miners especially manifest their intelligence by measures of precaution which are perfectly well known to them.

General instruction in first aid for employees.

First-aid supplies in the hands of employees and at an emergency hospital.

The following instructions printed in English, Slovish, Polish and Italian are in use in one of the Pennsylvania coal mines.

### DON'T!

### The Miner.

Don't hurry to the face until the smoke has cleared away.

Don't forget to sound the roof after each blast.

Don't undermine top coal or top rock more than to the extent of one row of shots.

Don't permit your laborer to load coal before you have replaced dislodged timber.

Don't conclude the roof is safe in spite of drummy sound.

Don't take a lighted pipe or lamp to your powder box.

Don't forget to keep your laborer and his pipe at a respectful distance when you are handling explosives.

Don't fire two holes at one time.

Don't shorten your squib in order to save powder in a wet hole.

Don't pass over danger signals.

Don't hurry in order to get out early.

Don't risk your life to save labor.

Don't forget the miner is responsible for the safety of the laborer.

## The Laborer.

Don't go into the face until the miner has examined it and pronounced it safe.

Don't fire blasts for the miner or in the absence of the miner.

Don't disregard the orders of the miner.

Don't run cars out from the face. Let the runner come for them.

Don't roam through old workings.

Don't walk haulage roads, go the manway.

Don't forget to close all doors as you pass through.

Don't forget to retreat to a place of safety when blasts are about to be exploded, etc.

## The Runners.

Don't allow drivers to run cars. Run them yourself.

Don't ride between cars in a moving train.

Don't ride on the side of the car.

Don't allow the drivers to make flying switches

Don't ride on the front bumper of mine cars.

Don't run cars on a grade until you know it is clear below.

Don't forget the headblocks are to be put on for the protection of runners and drivers.

Don't forget to call attention of the driver boss to bad roads.

### Drivers.

Don't take the doorboy away from his post to drive your mule.
Don't ride the bumper trailing your feet along the road.
Don't forget that a blast follows an alarm.

### Trappers or Door Boys.

Don't leave your door.
Don't allow your door to remain open longer than is necessary.
Don't run around after mules.

(Signed) V. L. PETERSON, *Sup't.*

**Treatment.**

No new principles are involved. While injured should be promptly removed from the place of injury, they can usually be properly prepared for transport before being moved. The judgment of rescuers must be exercised in this as well as in other respects.

Shock is always to be remembered and treated.

The individual emergency supplies should be as simple as possible, as the conditions in mines are such that elaborate equipment cannot be carried. A miner going to render aid to a comrade with two Red Cross first-aid outfits for wounds, a packet of picric acid gauze for burns and a flask of aromatic ammonia for shock is well supplied. When two rescuers are available under ordinary circumstances a stretcher should be carried.

Suffocation is one of the greatest dangers associated with mine accidents. It is therefore always necessary to remove injured persons or suffocated persons to a place where purer air can be obtained. Artificial respiration will often be required. The pulmotor is a valuable apparatus much used in mines

for this purpose. If no pulmotor is obtainable, the ordinary methods of artificial respiration must be resorted to.

In order that rescuers may enter a mine chamber filled with dangerous gases it is necessary that they be equipped with the oxygen helmet or some other satisfactory form of respiratory apparatus. It is also necessary that rescue parties be well instructed in transporting patients, for otherwise they cannot remove the injured and suffocated as promptly as is necessary.

**Symptoms.**

Are dependent upon the character of the injury.

A miner's injuries are usually produced by the falling of heavy weights and are therefore of a crushing nature.

Wounds are torn and are likely to be filled with dirt.

As with railway injuries, on account of the crushing character of mining wounds, hemorrhage is not likely to be severe. Though when the heart begins to recover its strength after the injury, bleeding from torn vessels may be free.

Fractures are common and are not infrequently compound. The bones are likely to be broken in several places. Fracture of the skull is not an uncommon injury. Shock is almost always severe and is the more dangerous as miners frequently must be carried a considerable distance before shock can be treated under favorable conditions. Suffocation from noxious gases is common.

Burns from explosions of powder or gas are frequent mining injuries.

The following supplies are recommended by the Red Cross for mines:

## Suggestive Ratio of First-aid Supplies per Man Employed. (For Mines.)

First-aid packets, Red Cross; one for every 20 men employed.

First-aid packets, Red Cross, for outside; one for every 20 men employed.

First-aid burn-packets, picric acid gauze, one for every 25 men employed in the gaseous mines.

Plain gauze, in one-yard pasteboard packages; one package to every 50 men employed.

Carbolated gauze, 10 per cent., one-yard in glass jars, one jar to every 50 men employed.

Plain gauze bandages assorted widths from 2 1/2 to 3″; one bandage for every 20 employees.

Plain unbleached muslin bandages, assorted widths from 2 1/2 to 6″; two for every 20 employees.

Plain unbleached muslin triangles, regulation size; one for every 25 men employed.

Absorbent cotton, in half-pound packages; three packages for each mine hospital and outside cabinet.

One 6 oz. bottle aromatic spirits of ammonia for each mine opening.

Six canvas strap tourniquets, U. S. Army, for each mine opening.

Three sets basswood splints for each mine opening.

Six ordinary clothes-pins for tourniquets for each mine opening.

The spirits of ammonia can be bought cheaply in bulk and the bottles filled at the storehouses and sent to the various workings as needed.

A hospital at a convenient place, usually at the foot of a shaft, should be established for every mine. Here all the emergency supplies named should be found.

See also Red Cross First Aid Box.

Severe mining injuries, like other injuries of the same type, require care from a doctor as soon as one can be obtained. Carrying a miner up a narrow shaft presents a peculiar problem in transportation if he must be carried. Both these subjects are discussed in the chapter on Transportation.

### 3. Injuries of the Factory and Workshop.

Frederick L. Hoffman, writing on "Industrial Accidents" in the "Bulletin of the Bureau of Labor" (No. 78, September, 1908), of the United States Government, says:

"As stated at the outset, upon a conservative estimate, the total mortality from accidents in the United States among adult male wage-earners is between 30,000 and 35,000, of which it should not be impossible to save at least one-third and perhaps one-half by intelligent and rational methods of factory inspection, legislation, and control. In addition there were approximately not much less than two million non-fatal accidents, that not only involve a vast amount of human suffering and sorrow, but materially curtail the normal longevity among those exposed to the often needless risk of industrial casualties."

It is not wholly clear whether the numbers quoted above apply to accidents in factories and workshops alone or whether they also include accidents occurring among men engaged in other industries. As the methods mentioned for diminishing the number of such accidents apply to factories only, however, it is at least clear that a large number of such accidents do occur in factories. A knowledge of first aid would therefore appear to be little less important to the man in a factory or workshop than to the railroad man or miner. Sometimes, it is true, a doctor can be procured much more promptly at a factory than in a mine or on a railroad, but this is not always the case; besides a doctor is rarely right on the spot where an accident occurs and a great deal of harm can be done through ignorance of first-aid methods in the short time required to get him.

**Causes.**

Being caught in machinery, cut by saws, burns from molten metal or caustics, falls, etc.

**Prevention.**

All accidents due to negligence are of course preventable. This involves proper construction of the plant and appliances, care on the part of employers and employees and the use of safety appliances.

The things which are necessary under the head of care are stated as follows by the Fidelity and Casualty Company of New York:

Good surroundings in the plant to make the workman as comfortable as possible; good light; no overcrowding of machinery; no slippery floors; sufficient instruction of workmen so they may not be injured through ignorance; no carelessness on the part of anyone; no unsuitable clothing which may catch in the machinery; care to use safeguards provided; no overwork; good ventilation; no intoxicating liquors during working hours; careful supervision and management; printed rules when needed; regular inspections and such other particular measures as are demanded by the needs of the special factory.

To these should be added:

Knowledge of first aid.

A proper accident room.

First-aid supplies.

The practice of having selected men instructed in first aid at the expense of the company is now becoming quite common.

As an example of signs which can be advantageously used in shops the insurance company mentioned above gives the following:

"Notify the engineer before doing any work upon main-line shafting, pulleys, or belts, while engine is stopped."

"Do not talk to man operating this machine."

"Whoever uses this machine without the guard, uses it at his own risk."

"Pick up all loose nails or boards with nails in them and deposit them in the cans provided for that purpose." (Running a nail in the foot is a common accident and one that often leads to serious consequences by reason of the blood-poisoning that often ensues.)

"Riding on hand-trucks in this department is strictly forbidden."

"Do not step through a belt under any circumstances."

**Symptoms.**

Same as with like injuries in general, but naturally vary greatly with injury.

Machinery accidents produce mangling, tearing and crushing injuries not unlike railroad and mine injuries. Power saws and other sharp instruments cause clean cuts which bleed freely. Electrical shocks are common in certain industries. In chemical works burns from caustics are frequent and in foundries and rolling mills burns due to contact with molten metal are equally common.

Shock is generally severe with all these injuries.

**Treatment.**

Similar to such injuries in general, do not forget to treat shock. When a first-aid box or outfit is on hand in factories and workshops danger from accidents is much diminished. A common and dangerous practice is hurrying off injured workmen to a hospital in an automobile or other vehicle without giving them any treatment before they leave. Instead of doing this, all large factories and workshops should have a room set aside furnished with necessary emergency supplies to which injured may be taken and given necessary first-aid treatment: Afterward, being attended by a doctor where they are, if their injuries are so severe that they should not be moved before

this is done; otherwise, being sent home or to a hospital after they have recovered from shock and their injuries have been given proper emergency treatment.

The Red Cross First Aid Box will meet the needs of most factories. Suggestions in reference to similar cases for special needs are furnished gratis by that association.

### 4. Injuries from Electric Apparatus.

Injuries from electricity have been fully described under the two headings Electric Shock and Burns from Electricity, so little more in reference to them need be said here. In fact, it would hardly be necessary to refer to them again under a separate heading were it not for the fact that in certain industries workmen need take little account of any injuries except those from electrical apparatus, and they therefore constitute an important and special class in themselves.

The statistics in reference to injuries from electricity are unsatisfactory, but it is a matter of common knowledge that such injuries are frequent and that with the increased use of electricity they are increasing. Moreover, it is well known that prompt treatment of electric shock makes all the difference between life and death.

The prevention of accidents in those working about electrical apparatus is based on the same general principles which have already been mentioned in referring to the prevention of accidents in factories, but in addition the workman is dealing with an invisible current which may be death-dealing in an instant, so he should exercise even more than common care. It is impossible to give here all the special rules necessary to avoid electric shock, as this would take entirely too much space. The following quotation, which is taken from the No. 1, General Pamphlet of the Fidelity and Casualty Company of New York, is well worth thought and observation.

"Rubber gloves should be provided by the employer and used on both hands in the handling of cables and wires, whether the parts are 'live' or not. The workman should satisfy himself before beginning work that the gloves are in good condition. Working on 'live' circuits, especially alternating current, should be avoided as far as is practicable. A man should not work on wire or conductors of any kind with sleeves rolled up or arms exposed, nor should wires ever be handled while standing or sitting in a wet place without extra precaution to obtain insulation from the ground. In handling any circuit over 115 volts known to be 'live,' it is best, if possible, to use only one hand. Keep the other in the pocket or behind the back.

"If the power has been cut off by opening a switch located some distance from where the work is being done, a sign should always be placed on the switch stating that men are working on the line.

"No examinations, repairs, or alterations, necessitating the handling of cables, wires, machines, or other apparatus under high voltage, should be made if it is possible to avoid so doing. In any case such work should be done only by a trained electrician."

The supplies required by electric light and similar companies are not many, but the few which are required are absolutely essential. Recommended by the American Red Cross are the following:

One 4-oz. bottle aromatic spirits of ammonia.
One collapsible cup.
One 2 oz.-bottle ordinary ammonia (marked poison), in rubber-stoppered bottle with small sponge tied to neck of bottle.
One dozen rubber bands to hold out tongue.
Two ounces carbolized vaselin.
Three Red Cross First Aid Outfits.
Two packages picric acid gauze.
Half-dozen roller bandages, assorted sizes.
One-half pound absorbent cotton.
Two wooden splints.
One pair scissors.
One strap tourniquet, U. S. A.

As will be noticed, these supplies are used for two distinct purposes: First, for electric shock, and, second, for burns.

## HERNIA OR RUPTURE.

This injury is spoken of here because it is usually due to the severe muscular efforts which are incident to hard labor. Naturally, however, such efforts are equally likely to cause hernia wherever they are indulged in.

There is a weak point in the lower part of the abdomen on each side, and occasionally muscular strain, a long breath being taken and the diaphragm fixed, will force a part of the intestines through one of these weak places. Thus a hernia or rupture will be caused. The only method of prevention that can be suggested is the avoidance of such muscular strains, but this of course is hardly practical.

When a hernia occurs there will be a feeling that something has given way and a lump will be found in the groin. As this lump contains intestines it must be handled with the greatest gentleness as rough handling may cause a dangerous injury to the intestines and probably peritonitis.

The patient should be placed on his back with his knees well raised up toward the abdomen and the legs supported with a pillow. Cloths wet in cold water should then be placed over the hernia and a doctor should be sent for as soon as possible.

## QUESTIONS AND PRACTICAL EXERCISES.

The instructor is advised to select injuries which are of particular interest to the special class and to have the members thereof treat them as they would actually have to do if the injury were real instead of imaginary.

In the course of this work the instructors are further advised to bring out the knowledge of the class by appropriate questions in reference to symptoms, prevention, etc.

## CHAPTER X.

# ORGANIZATION OF FIRST-AID INSTRUCTION.

### Classes, Associations, Course of Instruction, Contests and Red Cross First Aid Examination and Certificates.

Numerous inquiries in reference to how the Red Cross recommends first aid to the injured should be taught indicates that the results of its experience can be made of general value in organizing classes, associations and contests for teaching first aid in the industrial field. The practical experience of this association in this matter is set down in the present chapter which also tells something of the Red Cross examination and certificates.

### Classes.

First-aid classes represent the most common and generally available organizations for giving instruction in the subject. Whether a class or an association is formed in any particular place must depend on special circumstances, but associations are to be preferred to classes when practicable as the former bind men much more closely together for the general benefit.

Classes which are made up just as are classes to teach other subjects should always have a competent doctor as teacher, and it will be found much better not to have more than twenty-five students in a class, as the instructor cannot well supervise the practical work of a greater number.

The material required will be large wall charts, showing the skeleton, the arterial and venous systems, the heart and the circula-

tion of the blood, fractures and dislocations. These can be obtained from the Red Cross at cost price. A sufficient number, according to the size of the class, of splints, tourniquets, dressings, bandages, etc., should also be provided and when possible one or two stretchers. These will also be furnished by the Red Cross at cost. When practicable a boy should be hired as required for anatomical demonstrations.

The course should comprise at least ten sessions, and better twelve, each to last one hour and a half.

It would, of course, be most unwise to try to hamper instructors with directions on how they should teach first aid. It is thought, however, that a few words of advice to instructors to whom the work is new will not be out of place.

The experience of the Red Cross has shown that there is a tendency on the part of teachers to pay too much attention to anatomy and physiology at the expense of practical instruction in first aid. Naturally, what should be required of the student is not extensive knowledge of the former subjects, but the ability to treat practically all cases of injury which he may encounter.

What has been said above does not mean that anatomy and physiology are to be neglected. Enough for their purpose should of course be taught all students of first aid.

Prevention of accidents will be found to be a new subject to most students. The practical value of the instruction depends to a large extent on impressing its importance on all of them.

An attempt has been made in this manual to discuss all subjects freely enough for the purposes of those for whom it is designed, but in using it the instructor should naturally elaborate somewhat on subjects which are specially important to the particular class undergoing instruction.

As a last word to the instructor, above all be practical. Let the student himself show you how to administer first aid. If

you do it for him he will not, in a thousand years, learn how to do it himself.

## ASSOCIATIONS.

These organizations have already proved of value in this country, especially in the mining districts of Pennsylvania. The methods followed there may be taken as a model. The ratio of first-aid men required is estimated as one to sixteen workers and they should be so distributed through the mines that one will always be within call in case of accident.

The following is quoted almost literally from a first-aid handbook by one of the authors of this manual.

"The association should consist of men of temperate habits, not too young nor too old; men who will not faint at the sight of blood; intelligent, conscientious men, who will expect no compensation but their own inward satisfaction, supplemented, perhaps by the gratitude of those whose pains they alleviate.

"Such an association, having first organized temporarily, should then elect a President, Vice-President, Secretary, Treasurer and two or more local physicians as Medical Directors and Lecturers.

"Money will be required for the purchase of wall charts, first-aid packets, splints, stretchers, books and other materials. There are several ways by which this can be raised. When the association has been duly organized and the object of the fund made public, there should be but little difficulty in procuring the funds through some or all of the following channels:

"1. Every man in the mine should contribute a small sum.

"2. The superintendent and other officials of the mine should be asked for a donation. Undoubtedly, they will respond liberally.

"3. The various benefit societies in the town should be

approached. A dollar contributed by a benefit society may prevent a raid of a hundred dollars on its treasury.

"4. The members of the association should pay a small entrance fee and monthly dues.

"Regular meetings of the association should be held at least twice a month. The times for lectures and practice can be arranged by the medical directors.

"Each member should be furnished with a first-aid outfit, and the association should always keep a supply in reserve to replace used outfits.

"When a member has used his outfit he should report at the next meeting, giving full particulars of the kind of accident treated and how the outfit was used.

"In factories and mills it will be an easy matter to have the first-aid men evenly distributed. On railroads each association should be so formed as to have at least two first-aid men in each crew. They should always carry their first-aid outfits and reserve supplies in a caboose or baggage car.

"It will be the duty of the medical directors to prescribe a course for the association, extending over a period of at least a year, at the end of which time they may be examined. To the successful ones should be given certificates of efficiency, then some new members should be taken into the association.

"Directors should not examine their own association. It will be more satisfactory, for obvious reasons, to have the examinations conducted by directors from sister associations.

"When there are several associations in a town, or vicinity, interest may be kept alive by periodical contests, to consist of stretcher drills, tests of skill in bandaging, and carrying patients, etc. In each contest the winner may be given a badge or boutoniere bearing an appropriate design, and the name, number and location of the association of which the

winner is a member. They will be more highly valued than any article that gold can buy."

The remarks already made in reference to the teaching of first-aid classes and the material required for such teaching apply equally to the associations which have just been described.

To gain the first-aid certificate of the Red Cross it is of course necessary for students in associations to pass the same examination required from those in classes.

## COURSE OF INSTRUCTION.

The following course of instruction is recommended:

1. Structure and mechanism of the body.
2. First-aid materials.
3. General directions for rendering first aid. Shock.
4. Injuries without the skin being pierced or broken.
5. Injuries in which the skin is pierced or broken.
6. Local injuries from heat, cold, and electricity.
7. Unconsciousness and poisoning.
8. Handling and carrying of the injured.
9. Special injuries of mine or railroad, etc.
10. Lecture by an expert on means for preventing accidents.
11. General review.
12. Sanitary matters, prevention of contagious diseases, such as tuberculosis, typhoid, scarlet fever, etc.

The lectures should be shorn of all technical terms and half an hour is quite enough for them. Then the medical director or teacher should ask questions and superintend practical work by the class for half an hour. Practical work should be increased as much as possible just as soon as the men can do anything in this direction. After this, if possible, have the men discuss the subject among themselves telling about recent injuries they have seen, how they have dressed them, etc.

All the men should, if practical, have date cards for the year with numbers on the margin which are to be punched out at each meeting. The following is a sample of such a date card:

## PENNSYLVANIA COAL COMPANY

### HILLSIDE COAL AND IRON COMPANY

.....Pa.,.....1910

Mr. ..... members.

Meetings of the First Aid Corps will be held on the following dates, at the places shown. Meetings called at 7 p. m.

| 1910 | Dunmore Dist. Father Matthew Hall, Dunmore | Avoca Dist. Butler Hall Moosic | N. Pittston Dist. Y. M. C. A. Hall, Pittston | S. Pittston Dist. Y. M. C. A. Hall Pittson | Plains Dist. Y. M. C. A. Hall Pittston | Forest City Dist. Hillside Hose House Forest City | Mayfield Dist. Edmand's Hall Mayfield |
|---|---|---|---|---|---|---|---|
| | Tuesday | Monday | Friday | Wednes'y | Tuesday | Thursday | Thursday |
| Jan.. | 11 | 17 | 14 | 19 | 18 | 20 | 13 |
| Feb.. | 8 | 21 | 11 | 16 | 15 | 17 | 10 |
| Mar. | 8 | 21 | 11 | 16 | 15 | 17 | 10 |
| April. | 12 | 18 | 8 | 20 | 19 | 21 | 14 |
| May. | 10 | 16 | 13 | 18 | 17 | 19 | 12 |
| June. | 14 | 20 | 10 | 15 | 21 | 16 | 9 |
| Sept. | 13 | 19 | 9 | 21 | 20 | 15 | 8 |
| Oct.. | 11 | 17 | 14 | 19 | 18 | 20 | 13 |
| Nov.. | 8 | 21 | 11 | 16 | 15 | 17 | 10 |
| Dec.. | 13 | 19 | 9 | 21 | 20 | 15 | 8 |

PLEASE ARRANGE TO BE PRESENT

Dist. Superintendent

1 2 3 4 5 6 7 8 9 10

## CONTESTS.

Contests in different classes or associations and between such organizations have been found to be one of the best ways to stimulate study of first aid as well as to arouse public interest in this important subject.

The events in such contests should naturally be those having to do with first-aid problems of special interest to the particular organizations concerned. As a sample of such contests the following is taken from a program of an actual contest in the Pennsylvania mines.

Event No. 1.—Man insensible from gas, totally helpless. One man to pick him up, carry him fifty feet to good air, lay him down and perform artificial respiration for one minute.

Event No. 2.—Man injured in lower part of body. Two men to form four-handed seat and carry him fifty feet.

Event No. 3.—Man injured; leg broken. Three men to splint his leg with a mine sprag and some straw or hay; make temporary stretcher out of two mine drills and two coats, and carry fifty feet.

Event No. 4.—Man injured; wound right side of temple; one man to open packet and dress wound.

Event No. 5. General contest of eight teams. Man unconscious; wounds, simple fracture of right arm between elbow and shoulder; crushed foot with severe hemorrhage; apply tourniquet for bleeding, splints for fracture, perform artificial respiration for one minute, place on stretcher, carry fifty feet over car loaded with coal, pile of mine rock, then over fence and place in ambulance.

An officer in charge, judges, a time-keeper and a starter will be required for such contests.

The First Aid Department of the Red Cross will arrange such contests when desired and will award medals to successful contestants.

## Red Cross Examination and Certificate.

The Red Cross stands ready to arrange an examination for its certificate for any class of twenty persons on the conclusion of a course of instruction in first aid.

On application on behalf of such a class to the Red Cross First Aid Department an examiner will be appointed. Or an examination for a combined certificate of the Red Cross and the Y. M. C. A. may be arranged for through the latter association.

It is thought that the requirements in reference to the scope of examination for the certificates of proficiency in first aid will be of considerable interest to students of that subject. The examination is divided into two parts, as follows:

### I. Theoretical (ordinarily written).

1. How would you treat a dislocation of the shoulder in case the services of a doctor could not be obtained?
2. How would you treat a case of poisoning by illuminating gas?
3. How would you extinguish burning clothing?
4. How would you rescue a person in contact with a live wire?
5. How would you treat a severe case of shock?
6. In very cold weather what would you do to prevent frostbite?
7. Suppose a comrade had his arms crushed by a heavy weight, what would you do?
8. What would you do in case of severe hemorrhage from varicose veins?
9. How would you treat a rupture?
10. How would you treat a severe sprain of the ankle?

## II. Practical.

11. Bandage: (a) the knee, (b) the elbow, (c) the foot, (d) the jaw, (e) the forearm.

12. Dress fracture of: (a) lower leg, (b) knee-cap, (c) collar-bone. (d) Dress dislocation of wrist, (e) dislocation of lower jaw.

13. Dress wounds: (a) of chest with broken ribs, (b) crush of hand with severe arterial hemorrhage, (c) burn of lower leg, (d) compound fracture of thigh, (e) sêvere cut of head.

14. Carrying injured: (a) in arms, (b) across back, (c) fractured leg on stretcher, (d) person who has fainted on stretcher, (d) by "lady's chair."

## Directions for Examiner.

Each candidate will be required to answer six of the theoretical questions and no more.

Each candidate will be required to illustrate on a member of the class his answer to four of the subdivisions of questions 11, 12, 13 and 14. For example: 11 (a), 12 (b), 13 (c), and 14 (d).

If use of the stretcher is required, the candidate may select a member of the class to carry out his directions.

The perfect mark on each question is 10, and 75 per cent. is required for passing.

Examiners will mark written questions and will forward them as directed. In each case the examiner will also give his mark for each practical question.

Examiners will be expected to take all proper precautions to prevent the contents of examination questions from becoming known until the time of the examination.

It will be noted that the examination is sufficiently hard to show

whether the candidate for certificate is or is not competent to practice first aid under all ordinary circumstances.

The Red Cross realizes that it accepts a grave responsibility in issuing first-aid certificates and will only do so to persons who prove by examination that they can safely take care of injured.

# INDEX.

# AMERICAN RED CROSS FIRST AID BOOKS AND SUPPLIES.

American Red Cross Text-book on First Aid and Relief Columns.
American Red Cross Abridged Text-book on First Aid, Industrial Edition.
American Red Cross Abridged Text-book on First Aid, General Edition.
American Red Cross Charts. For Teaching First Aid.
American Red Cross First Aid Instruction Outfit.
American Red Cross First Aid Outfit.
American Red Cross First Aid Box. Industrial.

The first aid outfits mentioned are those which are on hand at the present time. Special first aid outfits are, however, prepared from time to time and any firm or individual which requires such an outfit may procure it at the lowest obtainable price by communicating with the First Aid Department, American Red Cross, Washington, D. C.

All books, charts and first aid supplies may be obtained from that department. The books and charts may also be procured from booksellers. Articles to replace those which have been expended from cases may be secured from the Red Cross First Aid Department. First Aid outfits and cases bear the seal of the American Red Cross and none is genuine without this seal.

**AMERICAN RED CROSS TEXT-BOOK, On First Aid and Relief Columns.** By MAJOR CHARLES LYNCH, *Medical Corps, U. S. Army.* A comprehensive text-book on first aid to the injured for the individual and for the organization. In this small book of 250 pages will be found everything on the subject of first aid which any student of that subject ought to know. Directions are also given on how to organize Red Cross Relief Columns. Price, $1.00 net.

**AMERICAN RED CROSS ABRIDGED TEXT-BOOK ON FIRST AID, Industrial Edition.** By MAJOR CHARLES LYNCH, *Medical Corps, U. S. Army*, and 1st Lt. M. J. SHIELDS, *Medical Reserve Corps, U. S. Army.* A small text-book which treats of first aid subjects of interest to the worker in the industrial field. This book is intended for the railroad man, the miner, and the factory and workshop. All subjects not of interest to the worker in the industrial field have been excluded so it is not necessary for him to search here and there in a large book for subjects of interest. Price, $ .30 net.

**AMERICAN RED CROSS ABRIDGED TEXT-BOOK ON FIRST AID. General Edition.** By MAJOR CHARLES LYNCH, *Medical Corps, U. S. Army.* This small book is an abridgment of the larger book by the same author and has been published to meet the demand for a smaller book at a very low price. While the industrial edition should be chosen by the worker in that field, for ordinary classes this book is to be preferred. Price, $ .30 net.

**AMERICAN RED CROSS CHARTS. For Teaching First Aid.** Being a Series of Five Wall Charts, Each 20 x 28 inches. Price per set, Mounted on Rollers, $2.50 net.

CHART I. The Skeleton.

CHART II. The Muscles. The various muscles being named, thus making this chart very plain for study and teaching purposes.

CHART III. Scheme of Systemic Circulation, in three colors.

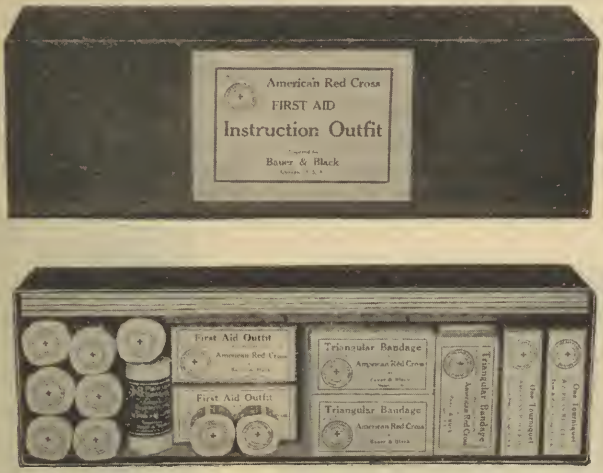
CHART IV. Fracture and Dislocation.

CHART V. Arteries and Points of Pressure for Controlling Hemorrhages. This chart is printed in two colors.

*Illustrated Circular upon Application.*

**AMERICAN RED CROSS INSTRUCTION OUTFIT.** This outfit is intended for instruction purposes. With it and the Red Cross charts any teacher will be supplied with all the materials which he needs to give a class practical instruction in First Aid to the Injured. It is packed in a pasteboard case, and consists of: ½ dozen triangular bandages, 1 dozen roller

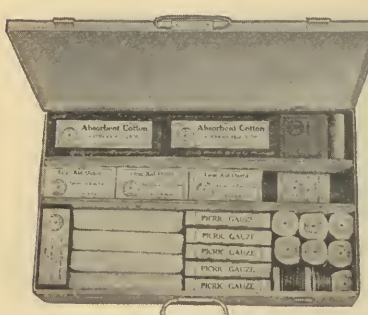
bandages, assorted sizes, 4 wooden splints, 2 U. S. Army tourniquets, 6 Red Cross First Aid Instruction Packets, 2 dozen safety-pins, large. Price, $3.00, f. o. b. Chicago.

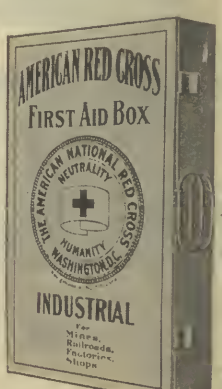



**AMERICAN RED CROSS FIRST AID OUTFIT.** This small outfit has received the highest praise from some of our most

eminent surgeons. It consists of a metal case which contains a gauze bandage with a compress sewed in its centre, a triangular bandage with methods of application printed thereon, two safety-pins and a card of directions. With it and splints which can usually be procured without great difficulty one is prepared to treat any ordinary injury. The case is hermetically sealed, so the contents which are clean will stay so. Price, $ .25, f.o.b. Chicago; postage, 6c.

**AMERICAN RED CROSS FIRST AID BOX.** Industrial. For Railroads, Mines, Factories and Workshops. This case is




well fitted for use in any industrial establishment. It is made of tin and neatly painted and packed. It consists of: American Red Cross first aid outfits, 6; American Red Cross large first aid dressings, 4; gauze, sterilized, 1-yard packages, 2; gauze bandages, assorted sizes, 12; tourniquet, 1; carbolated vaseline, 1; gauze, picric acid, 1-yard packages, 4; splints, wooden, 4; cotton, absorbent, ¼-yard packages, 2; pins, safety, 12; shears, 1; tweezers, 1; aromatic spirits of ammonia, 2-ounce bottle, 1; paper cup, 1; Red Cross First Aid Book, 1. Price, $6.00, f. o. b. Chicago.